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The effect of education on female fertility behaviour in El Gebel El Akhder in Libya

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THE EFFECT OF EDUCATION ON FEMALE FERTILITY BEHAVIOUR IN EL GEBEL EL AKHDER IN LIBYA

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By

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ABSTRACT

Libya, one of less advanced countries, has experienced extensive demographic change in recent decades. Although, efforts have been made to collect descriptive statistics relating to population change (such as Censuses), there has been no serious explanations of demographic change by academics of the reasons behind population trends in Libya.

This thesis sought to explore in a rigorous fashion the extent to which socio-economic circumstances, particularly increased levels of female education, has influenced female fertility behaviour. This hypothesis was examined for the population of El Gebel El Akhdar, Libya.

The study was based on a sample of 600 married women categorised by location (urban and rural), age (below and above 45 years) education level and socio-economic status. Quantitative and qualitative techniques were used to understand fertility differentials for both the older and younger women included in the survey both in urban and rural areas. It was demonstrated that there were important changes in female fertility behaviour taking place both in relation to the intermediate variables (marriage, post-partum infecundability, contraception) as presented in Bongaarts' theory (1982, 1985) and in relation to socio-economic factors (education, occupation, income, age difference of partner, place of birth and residence). Female education was given special attention in the research following the general research framework of Jeffery and Basu theory (1996). Females with higher

educational attainment, and thus higher employability, were characterised by relatively higher ages at first marriage, a smaller family size and a concurrently positive attitude towards approval and use of family planning and using contraceptive. They also engaged in a period of shorter breastfeeding. The inverse emerged as true for uneducated women.

In addition to the effect of education on fertility, it emerged that change in female fertility behaviours and attitudes were also influenced by the interaction of many other socio-economic factors such as income, occupation, and partner age difference. On the contrary, the place of birth and place of residence did not help to explain fertility outcomes.

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Ambark Edris Taher Hamd is sole author of this thesis. Unless otherwise stated, all references cited have been consulted by Ambark Hamd. The work of which this thesis is a record has been done by Ambark Hamd and has not previously been accepted for a higher degree. The conditions of the relevant Ordinance and Regulation have been fulfilled.

..... Ambark Edris Hamd (Author)

..... Allan Findlay (Principal Supervisor)

DEDICATION

I would like to dedicate this thesis to my parents; for as long as I can remember, they have given me everything since I was child so far; love, support, encouragement and the light at the end of every dark tunnel I have found myself in.

In addition, it is hard to find words to express my feeling for those who stand with me at every critical time in terms of their emotional support, help, and encouragement; my brothers and sisters who contributed in achieving this work. Also, I dedicate this work to my wife for her patience, support and unfailing encouragement during the preparation of this work.

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1 CHAPTER ONE: INTRODUCTION

1.1 INTRODUCTION

The past century has witnessed extraordinary changes in fertility trends around the world. How many children a couple choose to have would seem to be one of the most private decisions that there is, yet despite this there appear to be remarkable temporal and spatial regularities in the way that fertility has fallen. Fertility decline has not happened everywhere at the same time, but at any one location it appears that the socio-spatial context in which people have taken personal decisions has been very important not only in shaping how many children they wish to have but also in influencing when to start a family and what space to leave between one child and another.

This thesis is particularly interested in the factors affecting the onset of fertility transition in developing countries, with specific reference to Libya. The aim is to examine in particular the increasing influence of formal education relative to other socio-economic factors that influence female fertility behaviour.

In this introductory chapter I commence with a brief discussion of the onset of fertility decline in developed and less-developed countries. Then the focus turns to briefly considering why fertility change is especially interesting in a Libyan context. The body of the chapter then introduces the key questions, hypotheses and the objectives of study.

1.2 THE ONSET OF FERTILITY TRANSITION

The onset of fertility change differs not only between developed and less developed countries but also within countries. The change of fertility in a European context can be traced to the beginning of the 20th century according to Reher (2004), with the exception of Britain and France where the process started as early as the 1830s (Lesthaeghe , 1977, 1983; Woods 2000). Fifty years after the onset of fertility transition in Europe, some other so-called developing countries began to show signs of a change in fertility behaviour (Coale, 1983). The transition was fast in Asia and Latin America, but Sub-Saharan Africa, Pakistan and Bangladesh were much later to follow (World Bank, 1984). The onset of a decline in fertility in most of the less-developed countries came in the period 1965-1985 according to Casterline (1991) and Cohen (1993). In Asia, total fertility rates declined from 6 children per woman in 1965 to about 2.5 in the early 1980s (Casterline, 1991, 71). In Latin America, fertility had started to decline in the first half of the 1960s and by the early 1980s it had decreased to 3.6 children per woman (Chackiel and Schkolnik, 1996, 3). In Africa, fertility decline took place in the late 1960s and early 1970s and was quite advanced by 1995 (Garenne and Joseph, 2002).

Explanation for these spatial variations in the timing of the fertility transition has been the subject of many demographic theories. These are reviewed in detail in the literature review, but range from 'traditional' theories that focused on the influence of urbanisation and modernisation (Notestein, 1945), through more biological concepts such as Bongaarts (1982) ideas relating to the

intermediate determinants of fertility (such as the variable role of post partum infecundability) to social theorisations of how social, political and cultural discourses have selectively shaped fertility behaviour (Reher, 2004). In this thesis we give particular attention to how formal education (Caldwell 1982; Jeffery and Basu 1996) has impacted on household decision making about when to start a family and how many children to have.

The onset of fertility transition has varied not only between the global South and North but also within continents and countries. This has prompted demographers and population geographers to undertake socio-spatial analysis of fertility trends at different scales – the individual, the household, the village/community (urban/rural) etc - in order to understand better how socio-spatial contexts affect fertility outcomes. This is something that this thesis also tries to take into account, being concerned not only to understand the specifics of the Libyan context, but also to explore other scales of engagement that might have influenced how education has impacted on fertility decision-making.

1.3 THE ONSET OF FERTILITY DECLINE IN LIBYA

In the context of the demographic transition in developing countries, Libya provides a particularly interesting case study. This is because being an oil economy the population has enjoyed relative prosperity over the last half century (which might have led one to expect a more rapid onset of fertility decline than in less fortunate developing countries), yet at the same time it is an Islamic country (leading some to expect that high fertility would be

maintained). Islamic law for example, impacts on fertility by prohibiting adultery and childbearing outside of marriage. There is however huge variation in fertility between Islamic countries with political and cultural forces being important in accounting for how religious beliefs about family formation, women's roles and child bearing are interpreted. In the midst of this complex situation, the thesis explores how the specificities of Libya's political regime have implemented educational reform with all the implications that this has had for understanding the issues laid out above.

Libya has experienced substantial change in all aspects of its economic, social and political life since the end of World War II. Two events have been especially important: the arrival of Independence in 1951 and the discovery of oil around the same time. Before 1951 Libya was classified as one of the poorest and least urbanised countries in the world. It was dependant on British and American assistance through the United Nations for 60 per cent (1950/1951) of its budget (Hamdan, 1996, 123). The main economic activities for the population before oil was discovered were herd-rearing and primitive agricultural activities.

The discovery of oil led to massive changes in the Libyan economy from a relatively weak economy it became a powerful one based mainly on the production and export of oil (Hamdan 1996). And oil revenues provided the revenues to the state to engage in massive economic and social development programmes (Ministry of Planning, 1992). State engagement was evident for example in the building of a nationwide road transport network, the growth of

schools and hospitals and health centres, and the creation of employment opportunities in the tertiary sector (MoP, 1980).

Female education was an especially significant factor in the social changes that followed state investment in schools and university (Chapter 4 gives more details). The spread of education had a profound impact in the erosion of tradition norms and in terms of young people altering their attitudes to females working outside the home, contraceptive use, the cost of children, the age of marrying and family planning.

Economic change was a catalyst to other key changes in Libyan society and life style. There was a transformation from a rural and nomadic way of life to an urban one. Major urbanization resulted from massive rural to urban migration, especially to the two major cities of Tripoli and Benghazi. This led in turn to policies attempting to protect rural areas from de-population (Al Ekziri, 1995). These policies aimed to spread development more evenly across the country, by providing employment opportunities for people, and building schools, hospitals and health centres, transport network, houses in all Libyan regions whether rural, desert or urban settlements (Hamd, 2002).

This brief introduction to Libyan economic and social change helps to explain why it is very interesting not only to study fertility change in Libya, but more specifically why it is valuable to examine it in El-Gebel El Akhdar, a part of Libya whose development over the last fifty years has been shaped largely by state involvement in seeking to spread the 'benefits' of economic and social

development beyond the country's urban cores. El-Gebel El-Akhdar, the study area, located about 125 miles east of Benghazi, was similar to other rural parts of northern Libya in the first half of the 20th century. Since then the state has totally reorganised agriculture, financing nearly 10,000 agricultural development projects and investing heavily in educational and health infrastructure so that effectively almost all young girls now attend school (Ganous, 1995) which has resulted in the decline of the female illiteracy rate from 70% in 1973 (MoP, 1977) to 15% in 2006 (NAID 2009).

The effect of development on demographic change and especially fertility decline in El-Gebel El-Akhdar is of course hard to prove, but external indicators suggest rapid change. The crude birth rate for example declined from 56 per thousand in 1973 to 24 per thousand in 2004. The crude death rate also declined from 14 per thousand in 1973 to a suspiciously low 2.4 in 2005 (Civil Registration, 2008 & vital statistics). The pace of these changes is one of the reasons that attracted the author to explore the fertility transition in this region.

1.4 THE OBJECTIVES OF THE STUDY

The broad aim of this study is to explore fertility transition in Libya. This is done through focusing on El Gebel El Akhdar as a case study area. The intention is to examine the influence of formal education in relation to other socio-economic factors that affect female fertility behaviour using Bongaarts (1982) proximate determinants as a starting point for the analysis.

1.4.1 Specific objectives:

The first specific objective is to examine the extent of fertility change, (using measures such as GFR, ASFR, TFR, TM, CEB, period and cohort fertility, and parity-specific fertility behaviour) in El Gebel El Akhdar (Chapter 5).

Objective two is to explain spatial variations in fertility behaviour between rural and urban areas as well as between older and younger cohorts. The reason for exploring spatial variations is to identify the potential determinants of such variations with a view to understanding the roles of scale and (spatial) context on fertility behaviour (Chapters 2 and 5).

The third objective is to examine the education transition in Libya, concentrating on the evolution of female education and its impact on recent changes in the country's fertility rate (Chapter 4).

The fourth objective is to examine the effect of proximate determinants on female reproductive behaviour and fertility transition according to Bongaarts' model (Chapter 6), paying particular attention to age at first marriage (chapter 7).

The fifth objective is to explain fertility change (measured in terms of children ever born) in relation to underlying socio-economic circumstances (Chapter 8).

1.5 GROUNDED RESEARCH QUESTIONS

The specific objectives laid out above are tackled in this thesis through analysis of primary survey data undertaken by the author. This dataset is explained in more detail in the methods chapter (chapter 3). The survey is analysed using some grounded research questions that arise from the objectives listed above. These include:

To what extent can fertility decline be measured in El Gebel El Akhdar?

To what extent can change in female education be measured? And to what extent is it possible to measure the effect of educational transition on recent changes in fertility behaviour?

How consistent are the observed changes in fertility with the expected trends in the proximate determinants of fertility?

What have been the specific effects of biological-factors such as post-partum infecundability (breastfeeding), abstinence, and contraceptive use on female fertility behaviour? And how have socio-economic factors influenced biological factors?

To what extent have socio-economic circumstances (education, occupation, etc) influenced fertility through their impact on age at first marriage?

How has the fertility experience of mothers (measured by the number of children ever born) changed with the effect of socio-economic factors?

1.6 IMPORTANCE OF STUDY

The importance of the study arises from several factors. First, the majority of fertility studies in Libya are descriptive rather than analytic. Many also deal only with aggregate data and are unable to arrive at causal explanations.

Second, even where researchers in Libya offer some statistical explanation of fertility trends, there is a remarkable lack of conceptual clarity. This thesis uses regression modelling to achieve a schematic understanding of the ultimate and proximate determinants of fertility. As a result it seeks to offer a conceptual framework for interpreting Libyan fertility change.

Third, the thesis, by focussing specifically on the relation between education and fertility change, provides a starting point for other research seeking to identify more precisely the changing meanings attached not only to having children, but also to 'being an educated women in an Islamic society'. Although this thesis is not a qualitative study, the quantitative analysis that it provides offers new insights into the importance of education in affecting age at marriage and the subsequent fertility histories of Libyan mothers. Hence, this study aspires to measure the influence of perhaps the key variable affecting fertility attitudes and behaviour. The theoretical importance of the research therefore lies not only in the fact that it is the first study in Libya to carry out a comprehensive analysis of fertility based on such theories, but that it provides a launch pad that others might use to explore the meanings underpinning the education and fertility behaviours of women in Islamic countries.

1.7 RESEARCH STRUCTURE

In an attempt to address research questions and objectives, the study was structured into nine chapters. The research background, questions and, objectives have been set out in chapter 1. Chapter 2 explores the theoretical frameworks of some demographers that tried to explain the onset and reasons for the demographic transitions and fertility decline such as Thompson (1929) and Notestein (1945); Davies and Blake (1956) Caldwell (1982), Bongaarts model (1978, 1982) and Reher (2004). Also, it explains the concept and function of the family in Arab societies as well of marriage customs. Chapter 3 focuses on the research methodology and theoretical framework on which the research findings are drawn. It explains the determination of the sampling frame, describes the data collection methods adopted for both the urban and rural site as well as the qualitative and quantitative research instruments used. The chapter also describes the key data analysis methods used.

Chapter 4 discusses the reasons why education is a key factor in fertility behaviour change. This is explored through an observation of the evolution of education from the past to the present at different periods of time.

In the last few decades El Gebel El Akhdar [as well as in Libya as a whole] has observed a remarkable decrease in fertility rates at the same time as a rapid expansion of education, and other socio-economic changes. These themes are discussed in chapter 5 by using relative standard demographic metrics of fertility. Also, it was observed that the timing of fertility transition was varied

not only between countries but also within countries (between regions and between rural and urban settlements). These issues are also examined in chapter five in the context of the variation of fertility transition in Libya and in the study area using spatial analysis method.

The reasons for fertility transition in the study area were explored in subsequent chapters (6, 7, and 8). Chapter 6 focuses on the effect of biological factors on fertility behaviour as explained by Bongaarts' (1982) model [post partum amenorrhoea, marriage, abstinence and contraception], while, chapter 7 examines the influence of education and other socio-economic circumstances; education levels, occupation, income, place of birth and residence on the increase of age at first marriage. The effects of these factors are introduced in four theoretical statistical models in order to explore the direct and indirect influence of these variables on the age at first marriage as well their effect on each other.

The research turns to focus on exploring the influence of socio-economic factors in female fertility behaviour on the experience of the mother and the number of children (Children ever born) in chapter 8. A four stage regression using theoretical model is built to establish which of a wide range of socio-economic factors are significant in accounting for the number of children-ever born. These models allow a more rigorous approach to be taken to establishing whether education really matters in bringing about fertility decline.

The final chapter (chapter 9) then attempts to indicate the research implications and to interpret the significance of the research on fertility change in Libya and to identify (theory) and further questions for future research.

2 CHAPTER TWO: LITERATURE REVIEW

2.1 INTRODUCTION

This chapter explores the research literature on variations in fertility in time and space. The literature ranges from the first attempts to define demographic transition theories (Thompson 1929; Notestein 1945) to more recent models explaining change in female reproductive behaviour (Bongaarts, 1982; Caldwell, 1982; Jeffery and Basu, 1996). Over the last 15 years researchers have begun to recognise the limitations of producing overarching grand theories of fertility change (Woods, 2000; Reher, 2004) and have pointed instead to more modest models explaining fertility transition in relation to the specific social, cultural and spatial contexts in which it occurs.

The purpose of the chapter is to map the research literature in relation to the topics listed above, in order to identify the contemporary research agenda of geographers working on fertility issues. This is used to frame the researcher's grounded research questions and serves as a basis for what follows in later chapter.

The chapter commences with a review of the most important theories of demographic transition. More attention is then paid to the reasons for fertility behaviour change. This includes examination of Bongaarts' theory of the proximate determinants of fertility behaviour. Interest then shifts to explain the causes of fertility change through the influence of socio-economic-cultural factors. Particular attention is given to the impact of education on fertility. The

later part of the chapter considers the role of space in accounting for fertility transition.

2.2 DEMOGRAPHIC TRANSITION AND FERTILITY DECLINE

It is 80 years since the first attempt to identify and explain the demographic transition (Thompson, 1929). Many attempts to refine this theory were to follow but unfortunately, there is no agreement amongst demographers over any comprehensive theory of reproductive behaviour in space and time (Burch 1996, 2003; Hohn and Mackensen, 1982; Johansson 1993). The classical theories of Thompson (1929) and Notestein (1945) are still the best known demographic transition theories.

Thompson's (1929) early account examined mortality and fertility in relation three types of countries, each with very different population growth rates. Group A had declining growth rates and potentially faced population decline at the time of his work. Group B included countries where birth and death rates had fallen, but because their death rates had declined earlier and more rapidly than birth rates. Populations were still growing rapidly. In Group C birth and death rates remained high and had yet to enter any demographic transition (Kirk, 1996).

Thompson presupposed that countries would progress from Group C (high birth and death rates) to Group B (high birth-rates but declining death rates) to Group A (low birth and death rates) as they became increasingly industrialized. He used a framework to identify regions experiencing population problems and

to derive policy recommendations. For example, he concluded that Japan, then in a period of rapid population expansion, had only one policy alternative: "to expand by the acquisition of more territory" (Thompson, 1929, 43).

Thompson thought that the transition was a continuing global generalization. He found that "there were differences between the population structures of major world regions and that those differences were in a state of flux, but that they were largely determined by leads and lags in the decline of death rates followed by birth rates" (Woods, 1982, 160).

In 1945 Frank Notestein introduced the formulation of the best known version of classical transition theory; he not only provided a description of demographic change but also an explanation for population changes as well as a predictive mechanism for the control of fertility (Szreter, 1993, 671). He did not however claim that his generalization was a 'transition' (Kirk, 1996).

Notestein pointed to a lag between fertility and mortality decline which produced rapid population growth. Only when people became aware of high population growth and the limit of resource did they modify their fertility behaviour. Subsequently, researchers such as Woods (1982) identified several phases of transition:

1] Mortality decline caused by cumulative influences of the agricultural, industrial and sanitary revolutions. These led to better food supplies, an improvement in the standard of living, and improvements in health.

2] Rapid population growth caused by the temporal lag between the decline of mortality and fertility.

3] Fertility decline because the social and economic supports to high fertility have been removed.

Also, Notestein linked the appearance of a low fertility regime to the processes of modernisation, urbanisation, and a change of the significance of having a family. A large family size became "a progressively difficult undertaking; expensive and difficult for a population increasingly freed from older taboos and increasingly willing to solve its problems rather than accept them" (Notestein, 1945, 40). Furthermore, he pointed to the influence of urbanisation and industrialization on fertility; he stated that it is difficult to avoid the conclusion that the development of technology lies at the root of the matter (Caldwell, 1982).

He thought that the "high growth potential" of populations would give way to "transitional growth" once modernization began to affect their fertility. When industrialization and urbanization became commonplace fertility would reach low levels and the population would enter a stage of "incipient decline" (Demeny et al, 2003, 697).

Both Thompson and Notestein focused on the macro-structural features of society that determine the "demand" of children in terms of their economic value to parents. Later writers have given more emphasis to cultural influences

on fertility and to the diffusion processes during the fertility transition (Coale et al, 1986).

Despite the importance of Thomson and Notestein's efforts, they faced many criticisms. Questions were raised such as what is a 'high' and 'low' level of fertility and what is meant by the 'beginning', and 'course' of the transition (Taeuber, 1960). They were also criticised for their failure to explore the assumptions underpinning their analysis (Beaver, 1975).

Despite these criticisms the demographic transition model provided a descriptive generalization that was perceived to have value and which stimulated scholars to search for more a comprehensive understanding of population change (Davis and Black, 1956; Bongaarts, 1982; Caldwell, 1982).

Caldwell's (1982) work was particularly useful in extending thinking about demographic change. In pre-industrial societies with their high fertility regimes, Caldwell suggested net flows of wealth were from the younger to the older generation. The increasing cost of childbearing to parents provided a rationale for family size limitation. In other words, with the passage of time fertility declined as a result of a reversal of intergenerational wealth flows (Shaista et al, 2003).

Caldwell argued that the behaviour of fertility was therefore affected by the type of society and the level of development in which a fertility decision was taken. Although macro structural features remain important, Caldwell's (1982)

interpretation of fertility transition also included investigation of a family's internal economic structure in relation to inter-generational wealth flows.

2.3 THE PROXIMATE DETERMINANTS OF FERTILITY BEHAVIOUR

If Caldwell (1982) and others sought to modify transition models by giving greater emphasises to understanding family economic structures in relation to their social and development contexts, other researchers looked more closely at biological drivers of fertility. Bongaarts' (1982) in particular offered significant insights by relating the so-called "intermediate" or "proximate" determinants of fertility to the pattern of fertility observed at different stages in the development spectrum.

The term 'intermediate' fertility variable (or 'proximate' determinant) was first introduced by Davis and Blake in the mid of 1950s; they introduced eleven intermediate variables. These variables included involuntary factors such as the occurrence of sterility, and miscarriages (Davis et al, 1956). Although, the framework found wide acceptance, it only really became significant when Bongaarts (1982) found quantitative data to examine the impact of the proximate determinants on fertility rates.

Bongaart's model was based on the empirical findings of a study of 41 populations. These included developing and developed countries. He found only four of the eleven so-called intermediate factors were statistically important determinants of fertility for these countries. The four variables explained 96% of the variance in the total fertility rate of the 41 countries (Bongaarts, 1982).

These variables were marriage, contraception, induced abortion, and postpartum infecundability (Figure 2.1 & 2.2). He measured the influence of intermediate variables on fertility relative to four different demographic measures of fertility- the total fecundity rate, the natural marital fertility rate, the total marital fertility rate and the total fertility rate. Thus, "if the fertility-inhibiting effect of celibacy is removed, fertility will increase to level TMFR (Figure 2.1), the total marital fertility rate. If all practice of contraception and induced abortions are also eliminated, fertility will rise further to a level TN, the total natural marital fertility rate, Removing, in addition, the practice of lactation and postpartum abstinence further increases fertility to the total fecundity rate, TF" (Bongaarts, 1985, 155).

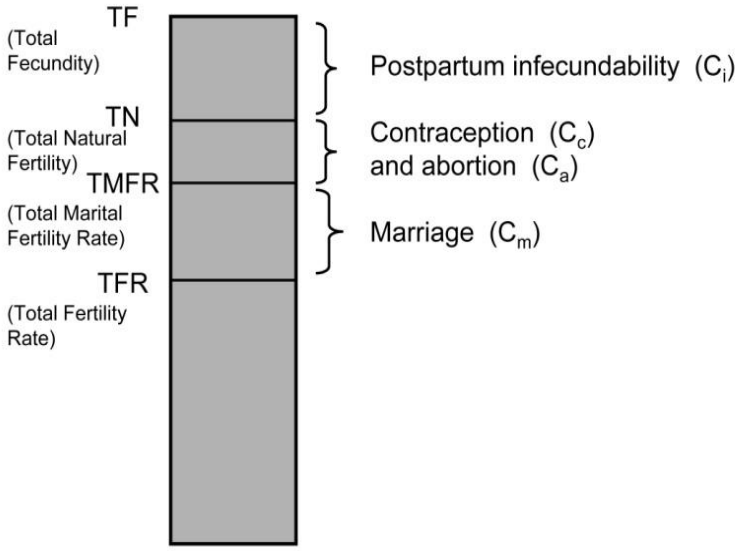


Figure 2-1: Intermediate variables and various measures of fertility
(Source: Bongaarts, 1985, 154)

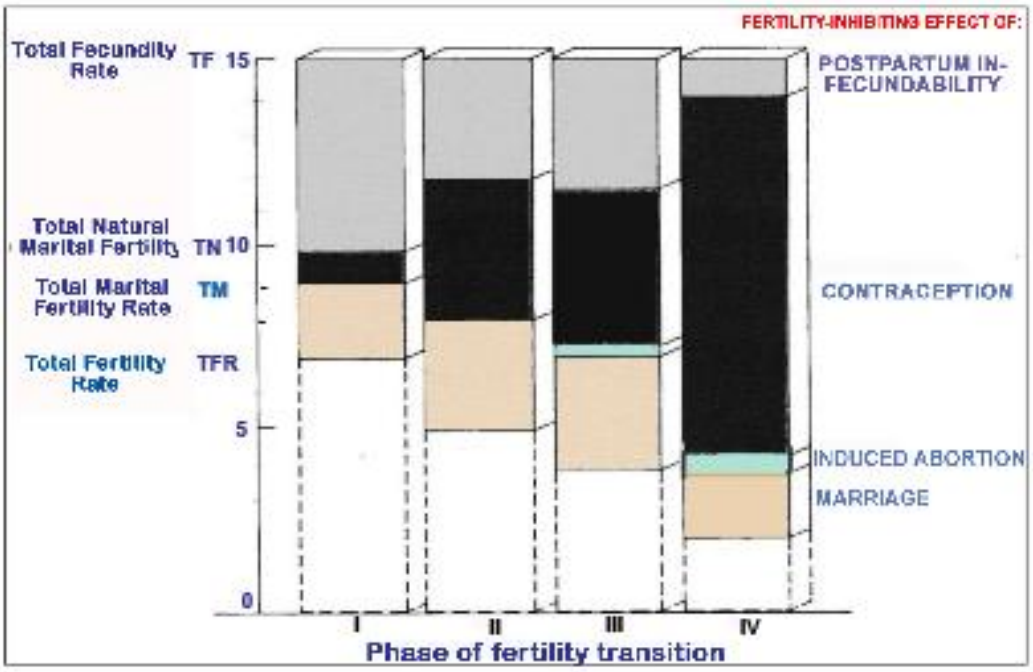


Figure 2-2: Estimated average total natural marital fertility rates, total martial fertility rates, and total fertility rates of countries in different phases of fertility transition.

(Source: Bongaarts, 1985, 164)

As a society moves from natural to controlled fertility Bongaarts suggests an increase in marital fertility control via increased use of contraceptives and by practicing induced abortion.

Much has been written on each of the intermediate/ proximate determinants and only the briefest comment is made here about the role of each one in individually reducing fertility. Age at marriage (the subject of an entire chapter later in this thesis) is particularly important. Early marriage increases the risk of pregnancy by raising the number of years that a woman is engaged in intercourse. A delay in marriage not only has the inverse effect in terms of

reducing the potential number of years of child-bearing, but by increasing women's exposure to education and the labour market, women who marry later are more likely to shift their focus from motherhood to other activities that might change child spacing and their desired family size (Agyei and Mbamanya, 1989; Jensen and Thornton, 2003).

The delay of age at first marriage is an important determinant of fertility as explained by Bongaarts (1985). In addition, marriage is a reflection of a set of economic and social factors; this assumption was proven by Sheela and Audinarayana's (2000) work in India in relation to 'the determinants of female age at first marriage'. They demonstrated that there were six explanatory variables that effect age at first marriage (Figure 2.3). These variables included place of birth, religion, caste, current age which effect directly age at first marriage and indirectly have an impact through education and consanguinity. They revealed that women's education played a significant role as an intervening factor of age at first marriage (Sheela et al, 2000). This hypothesis is tested in chapter 7.

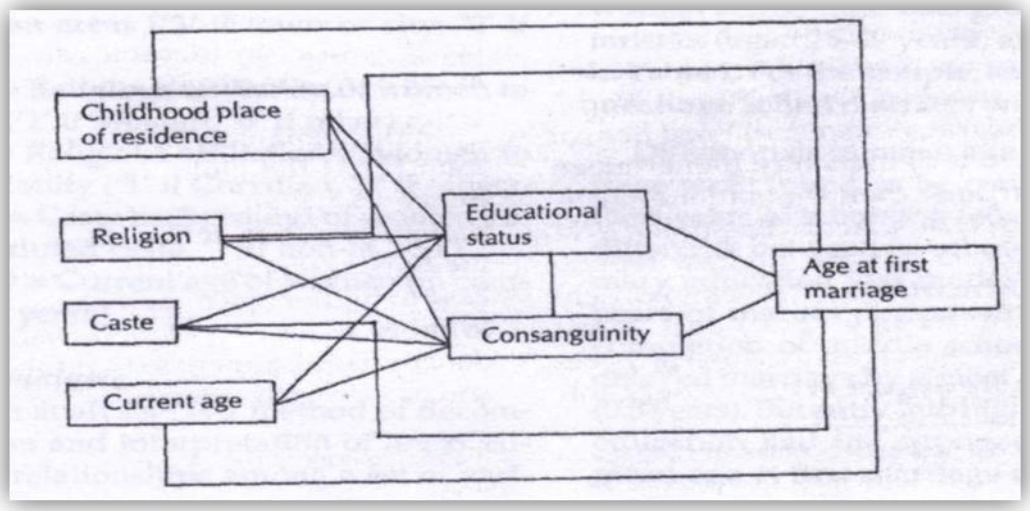


Figure 2-3: Conceptual model linking the explanatory variables to age at first marriage.

(Sheela et al, 2000, 26)

Post-partum infecundability is usually thought of in relation to breast feeding. In less advanced societies continuing breast-feeding for several years is not unusual and this has a direct influence on fertility (Cole et al., 1983). With economic development, there tends to be a reduction in the length of breastfeeding, as well as in its intensity, resulting in a change in the birth interval between children (Vekemans, 1997).

Induced abortion is only a minor influence on fertility in Bongaarts' model, but as Figure 2.2 indicates it appears to rise in importance as the fertility transition advances (Fathalla, 2007). By contrast contraception is of huge importance and becomes the dominant intermediate determinant of fertility in advanced societies (Figure 2.2).

Effective contraceptive use is not only a function of women's education and standing in society, but also reflects the powerful role of governments in trying

to promote fertility control through family planning (Hirschman et al, 1990). Cleland et al (2006) have summarised the impact as follows: "Family planning programmes in the past 40 years have played a major part in increasing the prevalence of contraceptive practice from less than 10% to 60% and in reducing fertility in developing countries from six to about three births per woman" (Cleland et al, 2006, 181). This is shown in schematic terms in Figure 2.2 in the increased significance of contraceptive use in determining fertility in Bongaarts' model.

Bongaart's model has been applied by a significant number of researchers. For example, in Iran, Erfani showed that the use of contraceptives had the largest effect in producing fertility decline. Some 61% of the reduction in fertility was attributed to contraceptive use, (Erfani et al, 2008). Singh et al, (1985) examined the effect of the proximate determinants on fertility in 29 developing countries. They found that the difference in fertility between rural settings and other places of residence was usually associated with the effect of a delay in marriage rather than contraception use, while the major difference between women with no schooling and those with a few years of schooling lay in contraceptive behaviour rather than in marriage (Singh et al, 1985). In the case of some African countries (Mali, Ondo state in Nigeria, and Northern Sudan) Jolly et al (1993) showed that most fertility happened within unions, while in Botswana, Liberia, and Uganda, substantial fertility occurred outside of marital unions.

In Africa, postpartum abstinence and prolonged breastfeeding have been shown to have a strong influence on fertility decline and birth spacing while contraceptive prevalence has been lower in Africa than elsewhere. Postpartum infecundability was the greatest fertility inhibiting factor in Kenya, Senegal, Sudan and Ghana (Jolly et al, 1993, 68).

2.4 THE EFFECT OF SOCIO-ECONOMIC-CULTURAL-ECOLOGICAL FACTORS ON FERTILITY

Although, Bongaarts' model is of great value, it does not consider the influence of socio-economic variables in producing fertility change. Attention in this section, therefore switches to the causal drivers of fertility change. They have been nicely captured in a schema (Figure 2.4) produced by Compton and Coward (1989).

Compton and Coward's schema is very helpful in illustrating the complex chain of causation that impact on fertility decisions. It shows for example that features such as the physical environment or population policy can directly influence the intermediate variables (and fertility), but that it is more probable that they interact with other factors that influence fertility. The socio-economic and political structure of a society will have an indirect effect on the bio-social, socio-psychological and socio-economic contexts in which knowledge and attitudes towards, contraception and family formation take place. There are many research papers exploring each of the causal links in Figure 2.4. For example, Cleland et al (1994) study the links between family planning policy

and attitudes to family size; Kohler et al (2005) look at genetic variation in the human population and the effect on fertility outcomes; Hank (2001), Manski and Mayshar (2003) and Munshi and Myaux (2006) study the influence of the social climate on fertility decisions. This body of research confirms, not only that these socio-cultural variables are key derivers of change producing modification in the intermediate variables and ultimately in fertility, but also that analysing the importance of any one social variable is very difficult in the absence of understanding wider context.

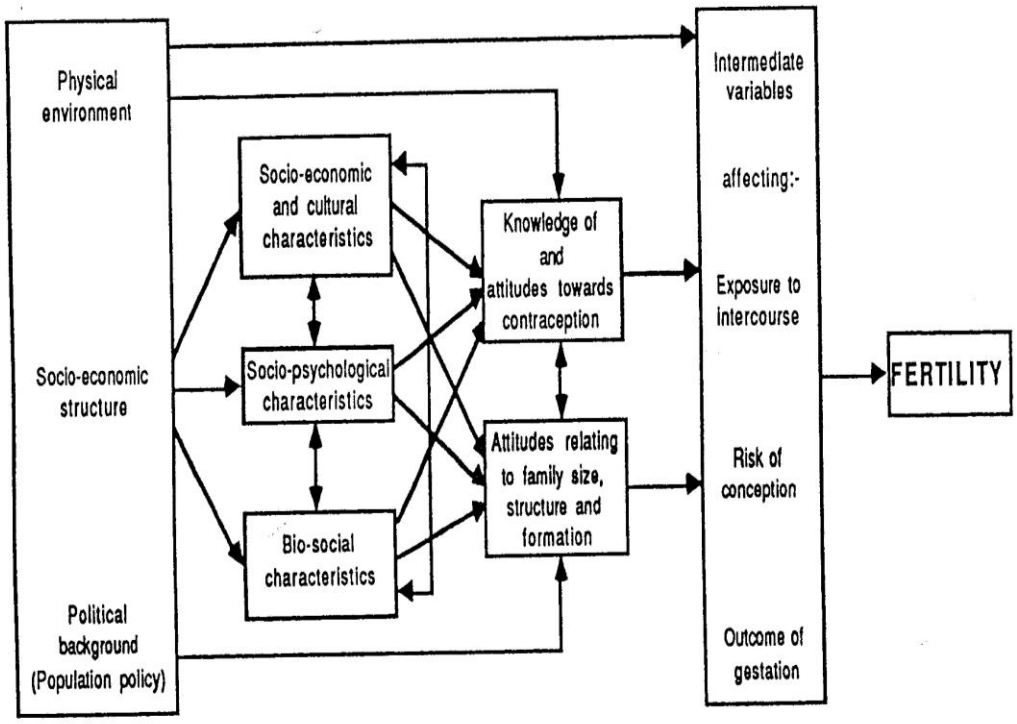


Figure 2-4: Socio-economic, political and physical variables affecting fertility. (Compton and Coward, 1989, 10)

2.5 THE IMPACT OF EDUCATION ON FERTILITY DECLINE

Given the conclusions of the previous section, I turn therefore to attempting this task in relation to education. Education and in particular female education is as a key factor responsible for change in female reproductive behaviour (Andorka, 1978, Cleland and Wilson, 1987; Bulatao et al, 1983, Subbarao and Raney, 1995). Like other socio-economic variables in Figure 2.4 education has both direct and indirect impacts on the intermediate determinants of fertility. The relationship to the fertility transition is complicated by the fact that there has been a parallel growth of education at the same time as other forces have favoured fertility decline. Social scientists often point to the spread of formal education as a key determinant of wider social change. They have linked the spread of mass education to a range of social transformations including economic growth and globalization, demographic transition, political change, the reorientation of childhood and youth, and the spread of new belief systems (Becker, 1993; Caldwell et al, 1988; Coleman, 1990).

Recognition that the spread of mass education not only produced social transformation, but also directly impacted on fertility through knowledge of contraceptive methods and awareness of the cost of children (Axinn, et al, 2001), led to a call in many countries to adopt female education as an effective population policy (Bledsoe, et al, 1999). This was perhaps the dominant message of the International Conference on Population and Development in Cairo in 1994 (Gould, 2009, 13). The line of thinking is captured in Bledsoe et al's words: "the increase in education of women and girls contributes to

greater empowerment of women, to a postponement of the age of marriage, and to a reduction in the size of families" (Bledsoe et al, 1999, 2).

One of the most important studies of the effects of education on female fertility was by Jeffery and Basu (1996). Like Compton and Coward (1989), they summarise their research findings in a schematic model (Figure 2.5) that shows the complex set of casual paths that link female education into the intermediate determinants of fertility.

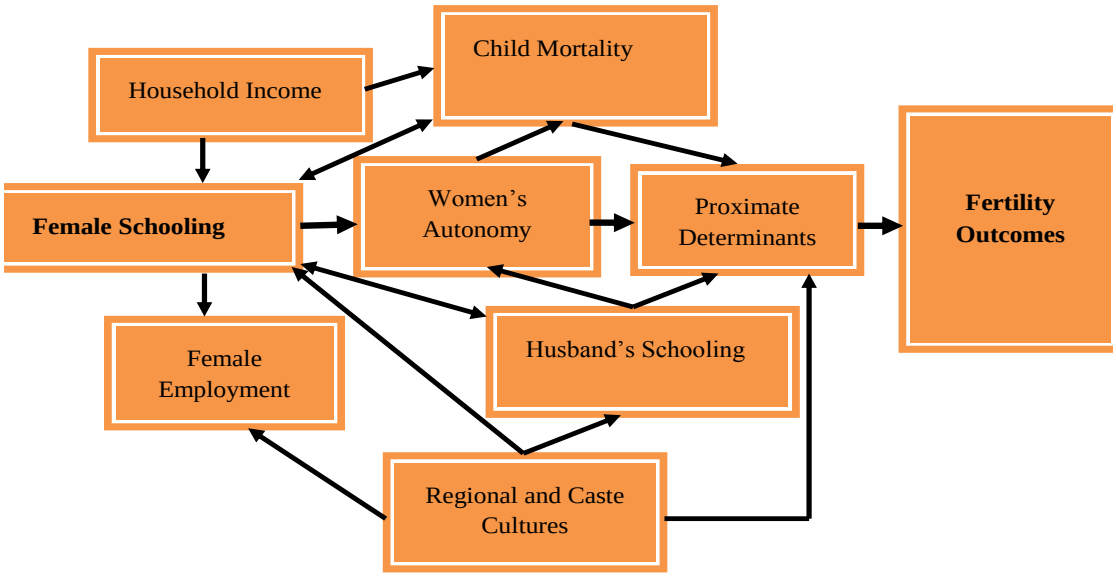


Figure 2-5: Possible relationship between female schooling and fertility behaviour

Source: Jeffery and Basu, (1996, 29).

Underpinning Figure 2.5 is the research of Basu (1992) on the effect of female education in increasing the chances of gender equality and increase the likelihood of women being able to influence decisions about desired family size.

Education has been shown to contribute to a wide range of other measures of female autonomy (Acharya, 2010; Pande et al, 2005). Moreover, educated women are more free to act on a range of domestic and extra-domestic matters than uneducated women (Basu, 2002). Yousif et al (1996) note that "schooling provides women with information about the outside world... giving them confidence in their capacities and abilities...increasing their knowledge about health issues and family planning which leads to the possibility of fertility control and longer intervals between births" (Yousif et al, 1996, 14). Furthermore, education supports women's well-being and improved opportunities to participate in the labour market and community affairs. The positive effects of women's education on a broad range of development issues in fertility are the reduction of child mortality, increased productivity and economic growth (Pande et al, 2005). Figure 2.5 also shows that female schooling increases the likelihood of women marrying a partner who has better education and this in turn also correlates with lower levels of fertility.

In addition, there is an association between education, employment, income and fertility. Jejeebhoy (1995) indicates a negative relationship between countries that have both higher per capita income and higher levels of female literacy which means both economic development and mass education influence childbearing behaviour (Diamond et al, 1999).

Moreover, education is a crucial determinant of economic progress: "the level and distribution of educational attainment have a strong impact on social outcomes, such as child mortality, fertility, education of children and income

distribution" (Barro et al, 2001, 541). These conclusions are supported by the findings of the UN's DHS surveys (Cleland and Wilson, 1987). Moreover, schooling weakens historical family values, Axinn et al, (2001) suggest that it increases consumption aspirations, thus "increasing the relative costs of childbearing and reducing the demand for children" (Axinn et al, 2001, 483).

An interesting feature of Figure 2.5 is that it suggests that there is an effect of education on fertility via improvement in health (Caldwell, 1994). Mother's literacy and schooling are closely related to child health and survival (Diamond et al, 1999). A survey in Nicaragua indicated that mortality and risk of malnutrition was significantly lower among women who were literate than those who remained illiterate (Sandiford et al, 1995). Also, Toros and Kulu (1988) found in their study of birth cohorts in Turkey that father's education was one of the most important factors associated with infant survival; babies whose fathers don't have primary school are 1.6 times more likely to die within the first year of life than babies whose fathers had not finished primary school. Babies whose mothers did not have education were 1.15 times more likely to die in their first year than other mothers (Gursoy, 1994).

2.6 THE IMPACT OF RELIGION AND CULTURE ON FERTILITY BEHAVIOUR

In Jeffery and Basu's model (Figure 2.5) religion and culture are given a marginal yet significant position. The impact of religion on fertility emerges from its impact on the proximate determinants and in the role of women more

widely in terms of their access to schooling and work. Every religion has views on fertility and fertility control and these views impact on attitudes towards family size and the rights of the individual to seek to engage in family planning (Christopher, 2006). Religion also impacts on attitudes to other intermediate determinants of fertility such as abortions. For example, the Qur'an states "you should not kill your children for fear of want" (Christopher, 2006, 192).

In the context of the Arab world, religion and other cultural forces come together to influence many other social structures that affect fertility. Perhaps most important of these are the concepts of the family and of marriage.

From an Islamic perspective, family is " a special kind of structure whose members are related to one another through blood ties and marital relationships, and whose relatedness is of such a nature as to entail mutual expectations that are prescribed by religion, reinforced by law and internalised by the individual" (Abd Al-Ati, 1977,19).

In Arab societies the family has always been the centre of life functioning not only to produce children but as the main social security system for elderly, sick or disabled people as well as being an economic refuge for children and young people (Rashad et al, 2005). This is not to say that the role of the family in the Arab world has remained unchanged.

The changes have been driven by socio-economic circumstances with the shift away from agrarian systems which supported both early marriage and extended families (Rashad et al, 2005, 1) to urban economies where the

majority of people live in cities and work in the industrial or service sectors. As a result, women are more likely to work outside their homes and these changes have militated against early marriage and large extended families. It is not simply the structure of the family that has changed from an extended to a nuclear form (Laslett, 1972) but the function of the family has changed.

In the traditional family, patriarchs ruled as absolute masters over their extended families, with this institution surviving in many rural areas (including in Libya) until the 1960s and 1970s. One of the most important features of many patriarchal systems is in the role of consanguinity in marriage. It was considered very desirable because it is maintaining family unity. In Libya, as in many Arab countries, there was a high rate of marriage between cousins. Among Arab countries, the highest rate of this type of marriage was in Libya, Sudan and Saudi Arabia where "40% to 50% of ever-married women aged 15-49 are wed to their cousins" (Rashad et al, 2005, 4). In addition, consanguineous marriages ensured inheritance remained within the family as well as the dowry in this type of marriage is less expensive (Ginat, 1982). These positive attributes also impacted on fertility (Figure 2.5) by reducing the power of women to determine family size, and by pushing down age at first marriage.

These religions and cultural forces may in part account for the lateness of fertility decline in the Arab world. Nevertheless there is evidence that a transition has begun. The total fertility rate of 3.4 children in 2000 was considerably lower than in previous generations, (6-8 children) (Fargues,

2005). There have been many reasons for this change but undoubtedly the investment of oil wealth in improved education systems has been critical in extending the length of education for girls. With the spread of education female autonomy has increased. This has enabled women to stand up to their husbands in relation to the matter of desired family size and in taking a pro-active stance on fertility control (Sathar et al, 2001; Mason et al, 1995).

Another factor has been the growing the numbers of women on the labour market even if single women remain under the authority of their family (father or legal guardian) until marriage (Fargues, 2005).

2.7 THE ROLE OF PLACE AND SPACE IN UNDERSTANDING FERTILITY BEHAVIOUR

The previous section illustrated how the spatial concentration of the Islamic faith in certain parts of the world, when combined with other cultural faces, produced a distinction patterning of fertility in the Arab world. In this last section of the literature review attention turns specifically to the geographer's interest in how space and place contribute to understanding fertility variation and fertility trends.

Graham notes that "The initial formulations of demographic transition theory included a very crude conceptualisation of space which was seen as a container of national populations" (Graham, 2000, 10). This conception of space continues in many parts of the academy, but geographers have since the 1980s problematised both "the societal construction of space" and "the spatial

construction of society" (Philo, 2009, 703). This has meant moving away from reviewing space as a neutral container that is filled by human activity. Instead space is increasingly interpreted as a relational concept, in which "space is 'folded into' social relations through practical activities. This allowed not only for the socialization of spatial analysis but also, crucially, for the specialization of social analysis" (Johnston, 2009, 708). For the analysing of fertility by geographers this philosophical advance should have been very helpful but in practice it has proven rather difficult.

After the hey-day of spatial demography in the 1970s and 1980s, confidence in geographers' ability to understand the contribution of space and place in fertility behaviour appeared to wane (Graham et al, 2001, 391). The reduction of geographer's interest may be attributed to many factors such as the spatial convergence of fertility that emerged after the demographic transition. The convergence of spatial variations in demographic regimes with low fertility levels led to a questioning of whether geographers should still engage with the topic (Coward, 1986; Jones, 1990). Wilson has observed that "both the nature and the magnitude of the behavioural and societal dynamics underpinning (fertility) trends have been effectively described and analysed" (Wilson, 1984, 202), leading him to infer that the research field in developed economies offered only diminishing returns (Wilson, 1990). There remain, however, several reasons why geographers should engage in fertility study (Graham and Boyle, 2001). These include, firstly, the need to engage with historical demography.

Spatial fertility analysis has also been shown to be of value in "modelling the diffusion of contraceptive knowledge as though it were analogous to that of any technical innovation; and by studying the changing spatio-temporal pattern of fertility decline in order to identify leading and lagging regions" (Woods, 1982, 102).

Second there is still a need for analysis of spatial variation in the analysis of fertility in many countries of the Global South. In this part of the world high birth rates are still observed as well as significant variations in fertility. In Sub-Saharan Africa "the average TFR was at 5.9 children per woman in Western Africa, 6.1 children per woman in Eastern Africa and 6.4 children per woman in Middle Africa. Scattered pockets of high fertility remain in South and Western Asia.....and the group of currently high fertility countries is expected to become more diverse with respect to fertility levels" (UN, 2001a, 3-4). There is therefore a need for spatial analysis to determine the factors affecting fertility variations not only between these countries but also within countries between urban and rural settlements (Compton, 1991, 77).

Third the significance of space in relation to social theory has meant that there is renewed geographical interest in the spatiality of fertility (Bailey, 2005). "Space is implicated in the construction of identities, both individual and group. Cultures are `situated' and places are created by the habitual interactions over generations between people and space. Thus, the aggregate categories used by population geographers need to be sensitive not just to the social construction of identities but also to their spatiality" (Graham, 2000, 267).

Spatiality, and its role in the social construction of identities, offers as Graham (2000) put it, an opportunity for population geographers to reassert their role as analysts of fertility.

Despite the opportunities to re-theorise geographical analysis of fertility "....What is surprising is that many population geographers seem to have been unwilling to apply their `geographical imaginations' to this task and link their understandings of population to the new understandings of space and place" (Graham, 2000, 266).

In conclusion, an interest in the causes of spatial variation led to population geographers taking an initial interest in fertility studies. There is still a persistence of spatial variations in fertility in the global South where the anticipated convergence patterns resulting from transition have yet to occur. These are issues to which we return in chapter 5. It can be concluded that there is still a need for the spatial approach in the Global South and historical demography (Woods, 2000). In the developed world and elsewhere there is a need to consider how spatially embedded social values produce other patterning in relation to fertility behaviour (eg in relation to child spacing), as well as to explore new geographies such as exploring the socially constructed meanings of pregnancy, parenting and child rearing (Underhill-Sem, 2001).

Finally, it is clear having reviewed existing literature, that there are a number of research questions relating to fertility analysis in Libya that need to be pursued in relation to the research objectives set out in chapter 1 (p7). For each objective the links to the literature are listed below as well as a brief statement of the wider significance of the objective.

The first objective was to examine the extent of fertility change in El Gebel El Akhdar. This thesis tackles this in relation to ideas from the literature about fertility transition (Thompson, 1929; Notestein 1945 and others). Of particular relevance to the analysis of this objective is Reher's model (2004) in terms of the way it identifies the timing of the onset of fertility transition in southern and northern countries. In order to measure fertility transition in Libya, I draw on Bongaart's ideas (1982) in terms of measuring fertility change by different demographic tools such as TF, TN, TMFR, and TFR.

Objective two explores the spatial variation in Libya including the study area. This is clearly be linked with Woods (1979) model (Modelling spatio-temporal fertility decline) which explores spatial variations in terms of identifying leading and lagging regions during a fertility transition. The Libyan case builds on his ideas, although the significance of the research in El Gebel El Akhdar lies in the rather different cultural forces producing socio-spatial changes from those described by Woods (1979).

Objective three focuses on educational transition in Libya and in the study area, particularly the evolution of female education. This objective links with Jeffery

and Basu's model (1996) in relation to the effect of female schooling as a key factor responsible fertility change. The significance of exploring this issue in an Islamic society such as Libya is very great and the research reported in this thesis provides an opportunity to explore whether the relations found in other culture regions also hold in a Muslim society.

Objective four examines the effect of proximate determinants on fertility. Clearly this objective is directly related to Bongaart's model (1982) which privileges four proximate determinants of fertility transition over all; others as explained earlier in this chapter. Perhaps the most important of the proximate determinants is exposure to marriage as measured in terms of age at first marriage. The literature review has explored this influence in more detail in relation to Sheela and Audinarayana's model (2000) which measures 'the determinants of female age at first marriage'.

Objective five examines the influence of various socio-economic factors on fertility behaviour by using CEB. Tackling the objective has been made easier by starting from an awareness of Compton and Coward's model (1989) which measures the influence of multiple bio-socio-economic factors on female fertility behaviour. As the thesis will show population geographers have given little attention to exploring the underlying causal determinants of fertility in the Arab World and the findings reported here are significant in charting the distinctive nature of the forces triggering fertility change in this specific cultural context.

3 CHAPTER THREE: RESEARCH DESIGN AND METHODOLOGY

3.1 INTRODUCTION

This chapter describes the methodology which is drawn upon throughout the rest of the thesis. The study of fertility is a multidisciplinary area which encompasses population, economic, social, biological and political issues. Population geographers and in particular fertility specialists are well equipped to investigate fertility variations and to offer explanations of spatial dimensions of fertility behaviour.

This chapter commences with an explanation of the research design and methodology of the study. The availability and quality of secondary data is evaluated. The next section reviews the techniques used for collecting information regarding fertility behaviour. Attention then turns to focus on the questionnaire survey design including the questionnaire contents, the sample size and type. The body of the chapter focuses on the conduct of the survey, the response rate and the methods of data analysis. Of particular importance is discussion of the reasons for concentrating on married women who had children. The chapter concludes with discussion of the obstacles faced in the fieldwork.

3.2 SOURCES AND QUALITY OF FERTILITY DATA

Research design involves organizing the collection and analysis of data in such a way that it supports the purpose of the research (Peil, 1982). The choice of methods in this thesis was driven by a desire to examine the influence of socio-economic factors, and especially the formal education of women on patterns of female reproductive behaviour.

It is important to point out the challenges faced by researchers in many developing countries including Libya in accessing appropriate data to answer their research questions. Basically in Libya there is no detailed national data regarding female fertility behaviour. Only one fertility survey was available to this researcher providing comparative secondary data. This was conducted by the Ministry of Health and Social Security in 2005. The Libyan Survey for Health of Maternal and Child (main report) (MoHSS, 2005) is of some value but includes little information regarding contraceptive use and breastfeeding.

There is very little international level fertility data for Libya. The country was not covered by the World Fertility Survey (WFS) or the Demographic and Health Survey (DHS) which provide comparative international data for many other African states (Cleland et al 1987).

Despite the dearth of national and international datasets on Libyan fertility, there are some secondary data sources that shed light on fertility trends. One of these is the census. In Libya censuses were taken in 1954, 1964, 1973, 1984, 1995 and 2006. These provide information on population size and

distribution as well as on gender characteristics. This data was used as a starting point in establishing a sampling frame for my field survey.

The sampling relied on the 2006 census which is considered the most reliable population source in Libya which was undertaken by the National Authority for Information and Documentation (NAID). It includes population size in each of the Libyan regions, distribution of population, economic activities, education status, and other variables. The census data covers all regions but there is no data for any specific part of each region. For example, only the data for the population distribution in the districts of El Gebel El Akhder region was available in the 2006 census rather than data regarding specific districts of the study area in relation to employment, education, marital status, economic activities and so on (the data is only for the whole El Gebel El Akhder region and other Libyan regions).

In addition to the census, vital statistics have been recorded in Libya for many decades. The National Authority for Information and Documentation (NAID) is responsible for preparation of vital statistics which provides information about the number of births and deaths for all Libya's regions including the study area. The data on vital statistics is considered reliable to some extent, especially after legislation in 1973 making registration of births and deaths compulsory. Vital statistics, like the census, only is available for whole region without mention of the districts of the El Gebel El Akhder region. Tapping into this data source made possible the spatial analysis of CBR and helped in answering specific objectives 1 and 2 of the thesis (section 1.4, (1), p, 7). Similarly, the thesis

draws on secondary data relating to educational enrolment and progression – a necessary source to be able to achieve specific objective 3. The Ministry of Education and censuses provide educational data which relies on the lists from education offices in each region of Libya regarding the education status of the population and those who are enrolled and engaged in different stages of education.

Despite extensive searches, no secondary sources were found relating to female fertility behaviour, attitudes to breastfeeding, contraceptive use, abstinence, family income, and so on. As a result, it was essential for the researcher to develop methods that could let him obtain primary statistics on these topics, albeit based on a small sample population.

3.3 SAMPLE SURVEY DATA COLLECTION IN THE EL-GEBEL EL-AKHDAR STUDY AREA

As a result of the limited secondary sources, it was essential to find alternative tools to obtain data to satisfy the research objectives.

3.3.1 Sample survey

A sample household survey was considered appropriate tool (in terms of the time and effort needed to collect reliable data) to use to test the main hypotheses posed by the thesis. "The sample survey is a standard tool of social research....It is a method of collecting information about a human population in

which direct contact is made with those being studied" (Bulmer et al, 1983, 27).

A sample survey is required when resources do not stretch to collecting data from all members of a population, and when we have to make inferences about the whole population from studying only some of them (Dixon et al, 1977). It has become in social science the primary means of collecting data on people and their characteristics (Clifford et al, 2010).

Questionnaire surveys are arguably best when focused on collecting empirical information about observed and measurable behaviour. They are effective in examining attitudes and belief. Consequently a sample questionnaire survey was chosen as an appropriate tool for collecting most of the information about fertility outcomes that is analysed in the thesis. It is however recognised by this researcher that the questionnaire is a tool that is limited in investigating many aspects of people's beliefs, behaviours and attitudes and therefore that only certain aspects of fertility change can be understood from the researcher's main research tool.

The questionnaire survey is a way of gathering responses in a standardised way which makes it more objective as well as being a relatively appropriate tool to collect information from a large group and area. However, in terms of the fact that quantitative survey approaches have strengths and weaknesses, some other qualitative research was also carried out.

In addition to the main questionnaire survey, interviews were undertaken to collect information about sensitive issues, where it was felt that questionnaire responses would be at best partial. For example, the researcher carried out interviews with medical staff on the topic of the uptake of contraceptive use; the author also visited civil registration offices in chosen districts in order to obtain data of population size and other related data of fertility.

An important phase of the survey was the classification of research tools according to objectives as indicated in Table 3.1. Accordingly, the research tools were classified against each of the specific objectives listed in the previous chapter. For objectives 1 and 2 questionnaires were the main source for identifying (and explaining the reasons behind) changes in fertility attitudes and behaviours and the extent of convergence or divergence between places (rural and urban settlements). Also, vital statistics data was used in terms of CBR analysis. Objective 3 was answered using secondary data by censuses, vital statistics and education records and reports. Objective 4 was addressed using questionnaire data and interviews in relation to factors influencing female reproductive behaviour. Objective 5 was achieved using questionnaire data regarding the number of children women had (and desired to have), and relating this to the influence of socio-economic factors such as level of education, occupation type, family income, age at first marriage and partner age difference, place of birth and residence.

Table 3.1: Objectives, data, research tools and analytic technique

Objective	Research Tool	Analytic technique	Chapter
The first specific objective is to examine the extent of fertility change, (using measures such as GFR, ASFR, TFR, TM, CBR, CEB, period and cohort fertility, and parity-specific fertility behaviour) in El Gebel El Akhdar	Household Questionnaire Survey and Censuses	Fertility transition measured by various techniques such as GFR, ASFR, TFR, TM, CBR, CEB, period and cohort fertility, and parity-specific fertility behaviour). Also, descriptive Statistics (Percentage, diagrams, Tables)	Five
Objective two is to explain spatial variations in fertility behaviour between rural and urban areas as well as between older and younger cohorts.	Household Questionnaire Survey and vital statistics data (Secondary data)	The spatial variation is also examined by the above tools	Five
The third objective is to examine the education transition in Libya, concentrating on the evolution of female education and its impact on recent changes in the country's fertility rate	Household Questionnaire Survey and Secondary Data (Censuses, education reports, Vital statistics)	Descriptive Statistics such as percentage, tables, and diagrams.	Four
The fourth objective is to examine the effect of proximate determinants on female reproductive behaviour and fertility transition according to Bongaarts model, paying particular attention to age at first marriage	Household Questionnaire Survey and interview	Examined by Bongaarts' model. Analysed by four multivariate regression models	Six and seven
The fifth objective is to explain fertility change (measured in terms of children ever born) in relation to underlying socio-economic circumstances	Household Questionnaire Survey	Four models built out by using Bivariate and Multivariate analysis (linear- modelling)	Eight

3.4 QUESTIONNAIRE DESIGN

In order to examine in detail the influence of the spread of formal education on women's behaviour and attitude regarding fertility a questionnaire was designed. The most important consideration in designing the questionnaire was to identify the important variables that should be investigated in order to establish answers to the core questions of the thesis (Appendix A includes a copy of the questionnaire).

Although the questionnaire collected a lot of information regarding female fertility behaviour, only some of the variables were selected for analysis. The reason for concentrating on only a sample of the variables (presented below) is that it was felt that the selected variables were the most powerful ones in building quantitative models to explain fertility change. In addition time constraints meant that it was not practical to look at all the variables investigated by the survey. This strategy permitted a more focused analysis within the time allotted for completion of this PhD research project.

The unused questionnaire data is of value in understanding fertility transitions and could be used in future in fertility research in Libya, particularly with regards to fertility behaviour analysis. For example the survey collected much information about the media and religion and the social environment of women's lives. All of these co-variates of fertility merit attention beyond the scope of this thesis and may well be used by the researcher in the near future to explore the qualitative dimension of his research topic. Constraints on time in

completing the PhD meant that I focused only on those questions that proved important to my final statistical data analysis such as age at marriage, breastfeeding, educational attainment, employment, and income and so on.

The variables used in the analysis are:

a) Basic information about respondents which covered age, date and location of birth. The first variable was the date of the respondent's birth. This was the most important variable for identifying the current age of respondents and at their first marriage and at the birth of their first child. It contributed also in the division of people according to age cohorts (older than 45 years old & less). The location of birth was posed to define whether the respondent was a rural or urban person in terms of their origins and to identify if the respondent was a migrant from a rural area to the city or vice versa.

b) Social and economic characteristics: The demographic and socio-economic profile was built up by asking questions about the population's characteristics and especially their educational status. Six levels of education were investigated starting from no education through to higher education (university & above). Later in the thesis, the statistical models produced by the researcher drew heavily on the variables collected in this part of the questionnaire.

   Two questions were introduced to establish economic information. Firstly a question was asked regarding family income per month including the

total income of family members as well as other sources of income such as income from farm, shops, and other activities. A second question focused on family income per year including income of all family members' activities. These questions aimed to uncover the effect of income on fertility rates and family size.

c) Biological characteristics: Twelve questions were posed to inspect biological issues influencing fertility. The first was marital status (first married, remarried, widowed, and divorced). Questions were also posed concerning the duration of breastfeeding postpartum amenorrhoea and absence, temporary absence of spouses as well as questions about induced abortion.

d) Information about fertility behaviour and attitudes: Specific detail was sought about the date of birth of children, their gender, and the age of the mother at the time of giving birth and the location of birth.

3.5 SAMPLE SELECTION

Once the questionnaire had been designed, two further tasks had to be addressed: i) defining the unit of analysis and ii) selecting a target population. In terms of the first question, it was decided to engage at the level of the household, with one questionnaire being completed for each household, even although many questions on the questionnaire asked for information about the characteristics of individuals within the household.

According to the 2006 census there were 31,120 households in the study area, raising the difficult question of which ones to sample to address the second issue listed above. For logistical and resource reasons it was felt that I could only collect detailed questionnaires for about 600 households. The final sample of 600 households was stratified to ensure that 300 households were located in rural areas (where the environment to somewhat is characterised by peasant agriculture) and 300 households were from urban areas.

Furthermore, each of the subsamples of 300 were divided into 150 with women who were 45 years of age and less and 150 for women who were aged over 45 years old. This ensured that in both urban and rural areas there were approximately 50% of the samples made up of women who had completed their fertile years and whose reproductive histories were therefore also complete.

The absence of house numbers for homes in the study area created difficulty for the author in defining which households to sample in each part of the area of study. In addition the list of population in civil registers did not match the real distribution of population. The ideal sampling approach in this situation is to attempt a Multi-stage probability sample (Fowler, 2002).

Multi stage sampling was needed in order to divide the households into sub-areas for more detailed investigation. Once this had been done a list was made of all dwellings in each selected sub-area and from this a precise list of dwellings was established to visit with the questionnaire. Two locations were

chosen and divided into sub-areas as presented in Table 3.2 and 3.3. These tables show how census results for each area fed through to determine the final sample household numbers in each area. The procedures that were followed are discussed in more detail below.

3.5.1 The sample of urban areas

Al byada, Shahat (Cyrene), and Masaa were selected as the main cities for the urban aspects of the survey Figure 3.1. Al byada was also divided to five wards as the last division of the 2006 census. Also, Shahat was divided to four wards while Massa included two wards.

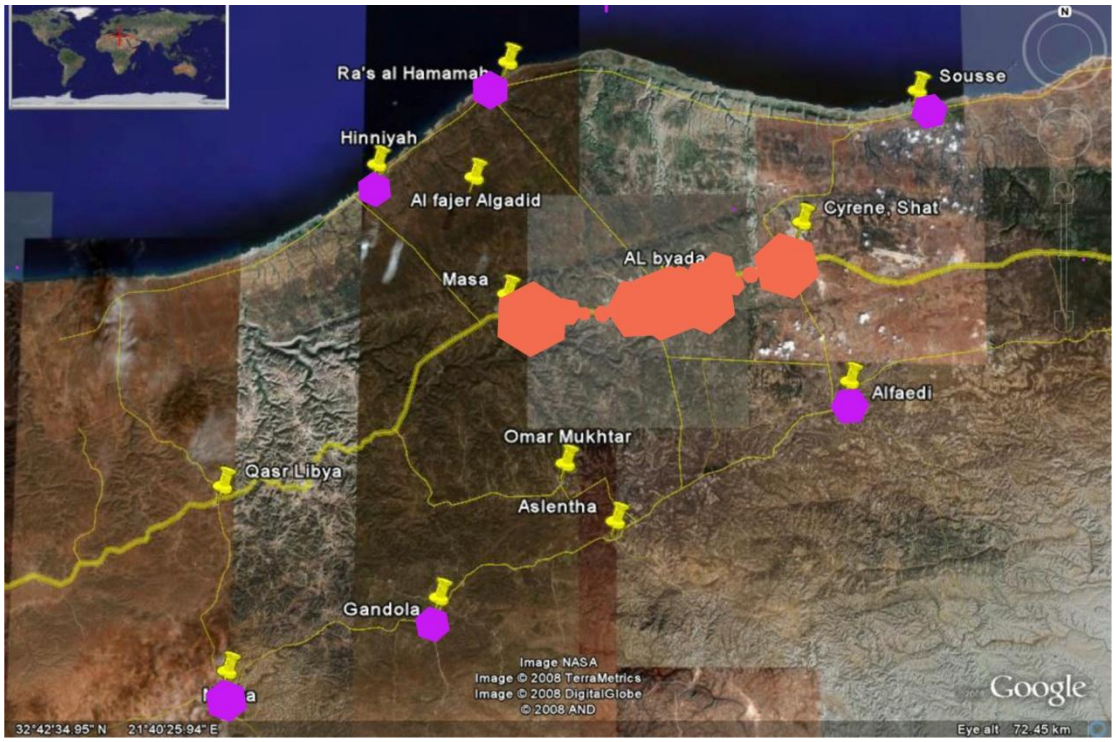


Figure 3-1: The chosen study areas
(Urban, Rural)

The target number of households in each location depended on the percentage of all households defined by the census. For example, Al Arika included the highest number of households in Al Byada about 8967 (41% of Al Byada household's total). Therefore, 123 questionnaires were distributed in this part of Al Byada. The final outcome was that 75% of urban households surveyed were in Al Byada (225); 19 % in Shahat; and 6% in Massa (Table 3.2, Figure, 3.2).

Table 3.2: Total population, households and the number of target households in urban area of El Gebel El Akhder 2006

Name of location	No of household	Male	Female	Total	%	No of target households for each ward	Total target households
West Al Byada	2644	6267	6275	12542	12	36	
East Al Byada	2293	6683	6494	13177	10	31	
Al Arika	8967	29153	29056	58209	41	123	225
Allsok Alkadim	1522	3486	3309	6795	7	21	
Al Zaoia Alkadima	876	1559	1578	3137	5	14	(75%)
The total	16302	47148	46712	93860	75	225	
New Shahat	2411	8015	7917	15932	11	33	
Old Shahat	1158	3653	3696	7349	5.3	16	56
Al mansorah	252	835	858	1693	1.1	3	
Al safsaf	267	979	1057	2036	1.2	4	(19%)
The total	4088	13482	13528	27010	18.6	56	
North Massa	894	3112	3111	6223	4.1	12	
South Massa	519	1641	1611	3252	2.3	7	19
The total	1413	4753	4722	9475	6.4	19	(6%)
TOTAL	21803	65383	64962	130345	100	300	300

Source: Prepared by the researcher from the 2006 census.

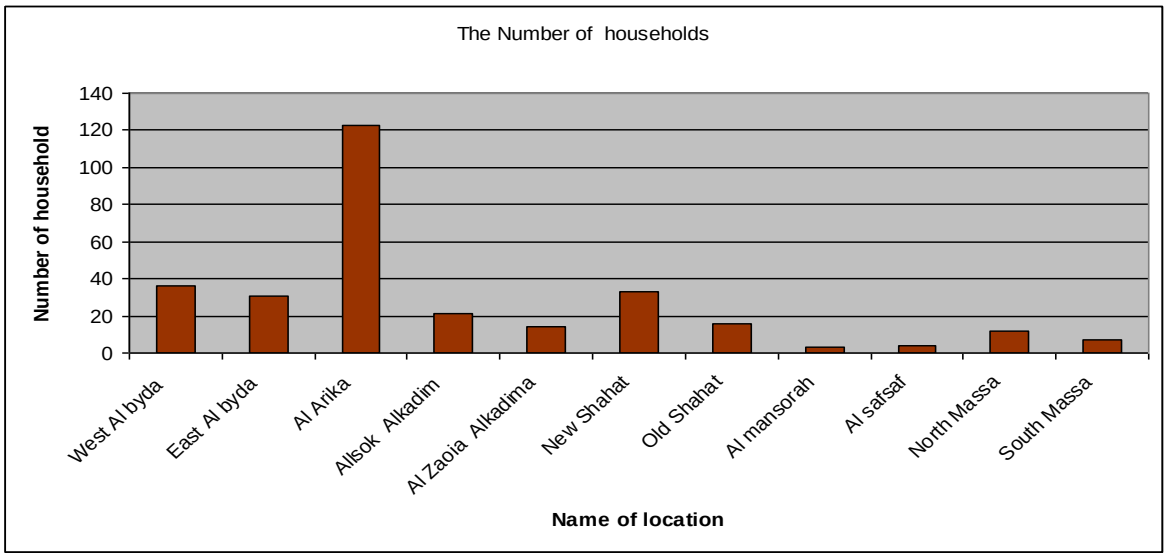


Figure 3-2: The number of households in each ward

3.5.2 The sample of rural areas

The target rural areas included, Soussa in North East Al Byada, Al Hania and Al hamama in North West Al Byada, Alfaedia in South East Al Byada and Gandola and Mraoa in South West Al Byada (Figure 3.1). The reason for choosing these areas was to represent some of the variations in rural areas in terms of the how far these villages were from the main city. Only villages located more than 40 km away from Al Byada were included. The size of the household sample was once again determined by the percentage of households in each area in the census (Table 3.3). Soussa was divided into two wards, (I added another ward which was built in recent years). Alfaydia was divided into three wards. Al Hania included two parts, while Gandola and Mraoa were divided into two parts respectively.

Table 3.3: Total population, households and the target population in rural areas of El Gebel El Akhder 2006

Name of location	No of household	Male	Female	Total	%	No of target households for each ward	Total target households
City Soussa	1008	2752	2838	5590	21	63	75 (25%)
Nasser	184	490	492	982	4	12	
The total	1192	3242	3330	6572	25	75	
North Alfadia	498	1772	1743	3515	11	33	78 (26%)
Gernada	567	1477	1895	3372	12	36	
Eshnishn	157	550	602	1152	3	9	
The total	1222	3799	4240	8039	26	78	
Al hamama	281	879	839	1718	6	18	45 (15%)
Al Hania	403	1351	1424	2775	9	27	
The total	684	2230	2263	4493	15	45	
Gandola	972	3072	3136	6208	21	63	63 (21%)
Mraoa	600	2085	2155	4240	13	39	39 (13%)
TOTAL	4670	14428	15124	29552	100	300	300

Source: Extracted by the author from the Census 2006.

3.5.3 Identification of target households

The questionnaire was distributed in two types of locations (rural and urban areas) as described above. All wards in the chosen areas were included in the survey. For example, Al Byada was divided to five wards then the number of target households was identified in each ward. After that each ward was divided according to streets (roads) and then the sample was drawn from each chosen street. The identification of targeted households in each street started with the first house, then the third, fifth and so on. This technique was repeated in rural areas.

3.6 SURVEY CONDUCT

The household questionnaire survey depended on personal face to face interviews by the research team and author. Delivery and collection was by hand. It should be mentioned that in many Islamic countries and in Arab societies in particular, it is difficult to make direct contact with females especially those who are married. This reflects religious and cultural values. Therefore, it was a critical challenge for the researcher to get information from those who were married. Also it was impossible for the author to ask husbands to conduct interviews with their wives. Furthermore, if we bear in mind the sensitivity of the topic not only in these societies but even in advanced societies regarding privacy, the challenge for the researcher to achieve his survey was even greater. These issues regarding fertility and relevant matters such as pregnancy, breastfeeding, contraception, income and so on are considered personal issues. These challenges placed more pressure on the researcher and research team.

In order to access target households, the decision was made by the author to choose his team from females made up of female postgraduate students at Omar Al Muktar University. This made possible contact with the key respondents (women in the sample). Although, the research team were educated females, they also faced challenges in relation to the authority of husbands in each household allowing the wife to cooperate with the research team. In some cases, some wives refused to give a response until the research team had permission from their husbands.

In addition, the strategy that interviewers followed in the case of meeting more than one married woman in a house was for the interviewer to conduct the interview with both married women (as long as one was more than 45 years old and the other was less than 45). If both married women were in the same category (45- or 45+), the interview was conducted with one of them and the selection of the respondent was based on availability for the interview, relative interest to participate in the interview and the discretion of the interviewer.

Another key issue was women who had no children, especially those who were not yet married. Although it was highly desirable to sample this population, the cultural etiquette of establishing the sexual behaviour of this group, was a challenge judged too great for the researcher to overcome in the time span of his study. For this reason unmarried women and women without children were excluded from the survey. This inevitably limits the capacity of the research to make direct comparisons between the surveyed population and many other fertility studies which include this population. It was nevertheless judged necessary to take this step in order to be able to conduct the survey at all in a Libyan context with the resources available to the researcher. It was considered that the results of the research would still have value in reflecting fertility trends amongst women who were married and who did have children.

Finally, it should be noted that the survey included married, divorced, widowed women who have children; due to the importance of the examination of the actual experience of mothers' fertility behaviours and attitudes whether between older and younger women or between rural and urban females.

3.6.1 Research team training and research ethics

After selecting the research team, a brief training was given to interviewers, who already were educated and had experience in conducting interviews. Therefore it was easier for the author to explain to them the objectives of the study, target households, sample methods, chosen areas and so on.

In terms of research ethics, two important ethical issues were considered in this type of survey (household questionnaire survey). One is confidentiality and another is anonymity. "Participants need to be assured that all the data collected will remain secure; that information supplied will remain confidential and participants will remain anonymous; and that participants have the right to withdraw from the research at any time without explanation. It is also sound research practice to offer to provide participants with a summary of research results at the completion of project and to follow through on this commitment" (Clifford, 2003, 127). Clearly the survey asked women about many very personal issues. In an Arab context, the whole issue of sexuality and child-bearing is a very sensitive one and so the researcher approached the topic with great care, seeking to assure his research subjects that any information that they chose to provide would not only be dealt with professionally, but that all records would be anonymised and total confidentiality could be guaranteed. Interviewees were made aware that they did not have to answer all questions posed in the questionnaire and that they could withdraw from the interview at any stage. Furthermore interviewees could request for information that they had provided to be withdrawn and not analysed. Inevitably the nature of the

research topic and concerns about being asked questions on such a sensitive issue as fertility may have had some impact on the quality of the responses received. This was a factor that the researcher attempted to take into account during the analysis phase of his work (Brydon, 2006; Harrison, 2006).

Confidentiality was considered holistically, not only between the researcher and the respondents, but inclusive of the research assistants involved in primary data collection. Since gender relations and power relations were implicit in virtually every aspect of the field work (between the researcher and the interviewees, between the interviewees and the male head of most households and between the research assistants and that researcher) the researcher felt that there was a moral imperative to try very hard to ensure that his work did not cause harm to those he was studying, and so time and effort was devoted to consider the ethical dimensions of the research most carefully (Momsen, 2006).

Aware that there was a risk of statements being made in the interviews and focus groups which might involve sexist, racist or other offensive views, the researcher focused on listening and paying attention non-judgmentally to what was being said and to avoid reproducing or legitimizing any discriminatory remarks by the interviewees or head of household through complicity. As Clifford (2003) argues, researchers need to think carefully about how to deal with such situations because there are no easy solutions.

Therefore, the interviewers were encouraged to carry out the interview in the form of a dialogue in order to make the interviewee feel confident in giving information as well as providing an opportunity for the interviewers to explain the boundaries of confidentiality to the respondents. For instance respondents were assured that their name and any personal information would be kept confidential and the results used only in scientific research which could serve society. In addition, the interviewers tried to use the local dialect to explain the questions, especially with more mature women. In addition the questionnaire had an introductory page which included a brief explanation of the importance of the survey and the importance of cooperation with the research team as well a reference to the confidentiality of the information and the use of the data in academic research (See Appendix A). Furthermore the introductory page included the name of the researcher and the name of university and his department so that respondents could get in contact at any time.

3.6.2 Pilot study

The pilot study was a mini version of the full-scale study and involved the specific pre-testing of the questionnaire and interview schedules. The advantages of conducting a pilot study are that it gives advance warning about points of weakness in the main research project where research protocols may not be followed, or whether proposed methods or instruments are inappropriate or too complicated (Polit et al, 2001; Baker, 1991; De Vaus, 1993; Teijlingen et al, 2001).

In the context of the researcher's work in Libya, a pilot of 40 questionnaires was undertaken on 18th October 2008. These questionnaires were distributed in various rural and urban areas; 20 were distributed in the main city; while the others were distributed in Soussa, Alfadia, Al hamama, and Gandola; 5 questionnaires in each area. The pilot study led to only minor changes to the questions.

3.6.3 The main survey and responses rate

The main survey was conducted at the end of November 2008. It was carried out as described earlier in Tables 3.2 and 3.3 in rural and urban areas. The main survey was completed at the end of February 2009.

The total number of completed questionnaires was about 600. This represents a 72% completion rate (Table 3.4). This number excludes the households that refused to participate (8%) and the questionnaires that had to be excluded due to the lack of some important information on issues such as income, number of children, birth date and levels of education (14%). Some 6% of questionnaires were not returned. To deal with these cases I substituted those with other respondents. The respondents who refused to be interviewed were high income people, shop owners and those in high status positions. Others simply did not trust the interviewers or felt that the information in the survey could harm their interests. The decision to avoid collecting data for single women also led to an increase in the non-response rate.

Table 3.4: Response rate of the survey

Results achieved	%
Interview achieved	72
Refused	8
Achieved by delivery and interview then excluded due to missing information.	14
Not achieved (Questionnaire not returned)	6
Total	100

3.6.4 Some obstacles in fieldwork

There were a number of obstacles encountered the author and research team during field work.

-The first obstacle as mentioned earlier was the absence of a post code for houses in the study area which made it difficult to withdraw the sample households.

- The second challenge was the breadth and length of the study area so the interviewers had to travel long distances to achieve their work. This added a great deal to the time and cost of doing the research.

- The third difficulty was that most of the older women aged over 45 were illiterate, so their understanding of questions was difficult which prompted interviewers to explain the questions more than once and in different ways. Also, some respondents avoided answering some questions such as income, breastfeeding, and date of marriage

3.7 THE LOCATION OF THE STUDY AREA

The study area is shown in Figure 3.3. The Mediterranean Sea borders it to the north, El Ghobba is to the east, and El-Marj is in the west and El-Wahat in the south. Al Byada city is considered the centre of the study area and is the second largest city in the eastern region of Libya after Benghazi. It lies about 200 kilometres east of Benghazi city and 100 kilometres west of the city of Darna.

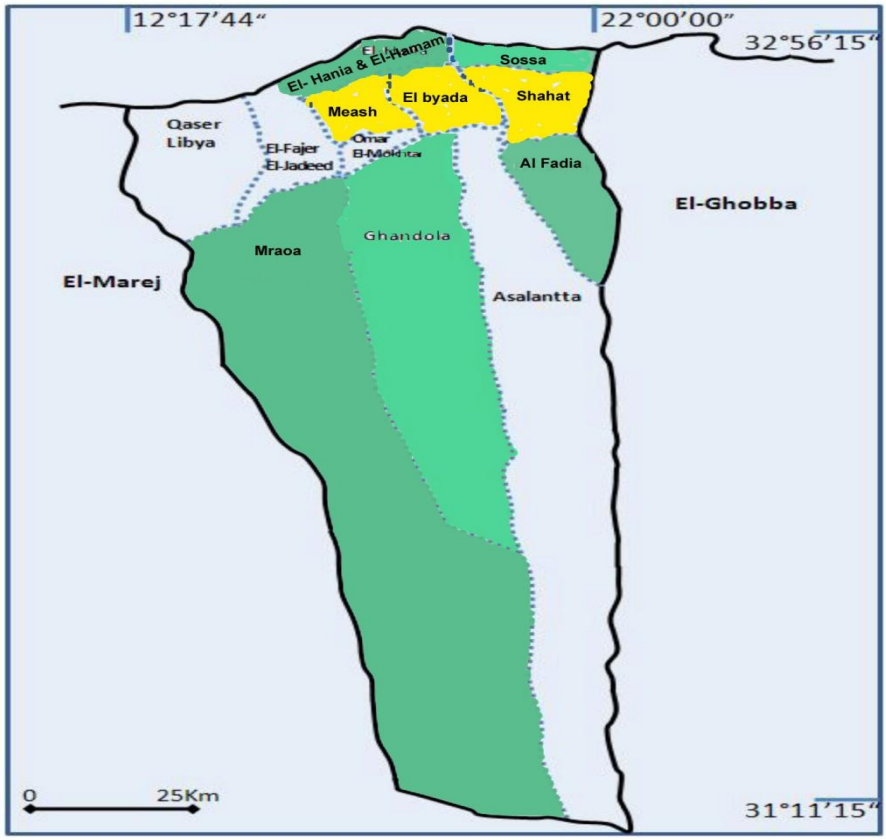


Figure 3-3: The location and districts of the study area
Source: Ministry of Planning, 1978.
(Urban, Rural)

3.8 DATA ANALYSIS

The field data was systematically organized, coded and analysed using Excel and SPSS. Both descriptive and inferential statistics were used, but as with much research in human geography the main results emerged (chapters six, seven and eight) from multivariate analysis using linear regression. It is argued that "most statistical analyses undertaken by human geographers are based on the general linear model notably those components that identify either the relationship of one variable to another (regression, which indicates the degree of change in one variable relative to the amount of change in another) or the strength of such relationships" (Johnston, 2009, 608). The reason for using these methods was to discover the most common factors that had an effect on fertility behaviour. Since much of the data was categorical in nature it was not evident until the analysis commenced whether ordinary least squares regression or log linear modelling was appropriate. In either case, the key issue was to develop a multi-stage modelling process that allowed me as the researcher to engage in examination of theoretical models of age at first marriage and of fertility outcomes in relation to many independent socio-economic variables. The statistical models were used to determine the relative importance of each independent variable in terms of zero order correlation coefficients before advancing to examine the relative power of each variable when combined in a multivariate model.

In addition to statistical analysis, some qualitative analysis was also attempted in order to extend the understanding of the topic area. "Many writers argue

that the two (quantitative and qualitative methods) can be combined within an overall research project (mixed methods research). This term is widely used nowadays to refer to research that combines methods associated with both quantitative and qualitative research" (Bryman, 2008, 23). Qualitative analysis was judged especially important in explanation of people's feelings and value systems in relation to transitions in fertility behaviour and education. Sensitive issues that were best understood using qualitative methods included analysis of the meanings underpinning attitudes to education attainments, length of breastfeeding, female employment and ideals relating to family size.

4 CHAPTER FOUR: EDUCATIONAL TRANSITION AND FERTILITY IN LIBYA AND IN THE STUDY AREA

4.1 INTRODUCTION

A key factor contributing to social change in Libya over the years is the development of education. Although an educational system had been in place as far back as the 14th century, significant expansion of modern education started with the country's economic development plans of the 1960s. There followed a marked increase in the number of schools and educational institutions with an apparent increase in the number of educated men and women at all levels. The period also coincided with the beginning of the Libyan oil revolution that led to significant economic growth and potential increase in per capita income.

Arguably, it is this economic development over the years that accounts for the remarkable improvement in education including the establishment of new and diverse educational institutions in both rural and urban areas.

Without doubt, educational expansion in Libya had a significant positive impact on shaping modern values and practices. It also led to the gradual disappearance of old systems (people's thinking, tradition and culture norms etc), and apparently replaced by new ways of thinking and behaviour. For instance, unlike the old educational system, the modern curriculum paves the way for women to obtain work outside the home. New attitudes emerged about

what were acceptable marriage customs; there was recognition of the cost of raising children and the acceptability of limiting family size. Most importantly, the expansion of female education broadened women's horizons in Libyan society, particularly in the context of being part and parcel of economic development.

The following sections provide an overview of the transitional phases of development in education in Libya. The sections focus on the historical background of the educational system through five main periods of administrative control. These include the Ottoman era 1551 – 1911; the Italian occupation 1911 – 1942; the British and French occupation 1943 – 1951; the period under the monarchy; and the Gaddafi era from 1969 onwards. The analysis, in providing an account of this educational transition, will show how it has contributed to bringing about social change, particularly with regard to females. It will also show in a descriptive fashion how the expansion of female education may have shaped the current fertility rate in the country. It therefore, provides contextual information relevant to later analytic chapters.

4.2 HISTORICAL BACKGROUND OF THE EVOLUTION OF THE EDUCATIONAL SYSTEM IN LIBYA

4.2.1 The Libyan educational system in the Ottoman era (1551-1911)

Libya became part of the Ottoman Empire in 1551 and remained so until the Italian invasion in 1911. During the Ottoman era Libya was declared an independent monarchy from 1711 – 1835 [as part of Ottoman rule]. During the

Ottoman Empire, education was essentially of a religious nature associated with mosques and religious institutions such as the Katatib [the Quranic schools] and Zawayya [religious lodges] (MoE, 1974). These institutions were apparently established through individual efforts. They taught Arabic language, Quranic science, Islamic jurisprudence and the Hadith (MoE, 1974), suggesting that education was orientated towards religion. Libyan education during the early part of the Ottoman Empire suffered from a limited curriculum and the absence of opportunities for females, which reflected wider societal discrimination against females. In the last decade of the nineteenth century, however, the Ottoman regime began to introduce a more modern education system mainly for the purpose of providing employees for the state's bureaucracy and the army (MoE, 1974). Varied levels of educational institutions were established. Firstly, primary schools, initially located in Benghazi and Tripoli, were encouraged to be funded by private means and provided three years of study. In primary schools, pupils were taught Arabic and Turkish, the Islamic religion, Turkish history, geography and mathematics. Secondly, the Al-madaris al-rushdia [matured schools] was set up to provide three years of study for pupils who had finished their study in the primary schools. Pupils in these schools started at age 11 and finished at age 14 or 15 (El-Sheikh, 1972). The matured schools were divided into military and civilian and provided a modern scientific curriculum and lessons in Turkish by Turkish teachers. Five of such schools were established by the state in Tripoli, Benghazi, al-khummus, Derna and Fazzan. A separate school was established for girls in Tripoli (El-Sheikh, 1972).

Finally, the preparatory schools, which filled the same role as secondary schools in the current education system, were set up to provide four years of education. Although pupils in these schools studied Arabic, Turkish, Persian and French, Turkish was the main language (Al Komati, 1978). Towards the end of the Ottoman Empire in 1911, at least 17 such preparatory schools existed, with a total enrolment of approximately 4814 pupils. These were established and run by both private and public institutions in Libya. Of the pupils, 69 % were males and 31 % female (MoE, 1974), emphasising the existing educational disparity between male and female at that time.

4.2.2 Libyan education in the Italian period (1911-1942)

The Italian occupation of Libya in 1911 marked a period of educational disruption. The occupiers' intention had been to replace the existing educational system with fascist ideology, leading to a complete Italianization (El-Sheikh, 1972). In the early period of occupation they attempted to abolish all the educational institutions that had been established by the end of the Ottoman Empire. These policies met with fierce resistance from the Libyan people, and resulted in the death of many Libyans and the loss of land for many people, but they continued to refuse to send their children to the Italian schools, fearing they would lose their Islamic faith, culture and traditions (El-Sheikh, 1972). Although by 1922-1923 as many as 88 schools had been established by the colonial power, many Libyan citizens were not willing to compromise their heritage and continued to struggle against the Italianization.

The period 1938-1943, covering World War II, resulted in Italy losing control of Libya to the British and French and the closure of all Italian schools in Libya (MoE, 1974).

4.2.3 Education in the era of British and French administration (1943-1951)

An apparent effect of the 1943–1951 period was the realisation among the Libyan population of the importance of education. There were increasing demands to re-open the schools which had closed during the war. However, following the Italian defeat, the Libyan educational system continued in turmoil. The education curriculum remained unstable, which led to frequent and extensive changes in methods and subject matter. Education policy was unclear and fragmented, resulting in differing levels of development throughout the country. Libya was made up of three regions (Figure 4.1); Cyrenaica (Barka), Tripoli and Fezzan. In Tripoli, the Palestinian education system was adopted but later replaced by the Egyptian system of education. Cyrenaica experienced only the Egyptian education system. In Fezzan the French administration made little or no effort to improve the education system (Nicola, 1962).

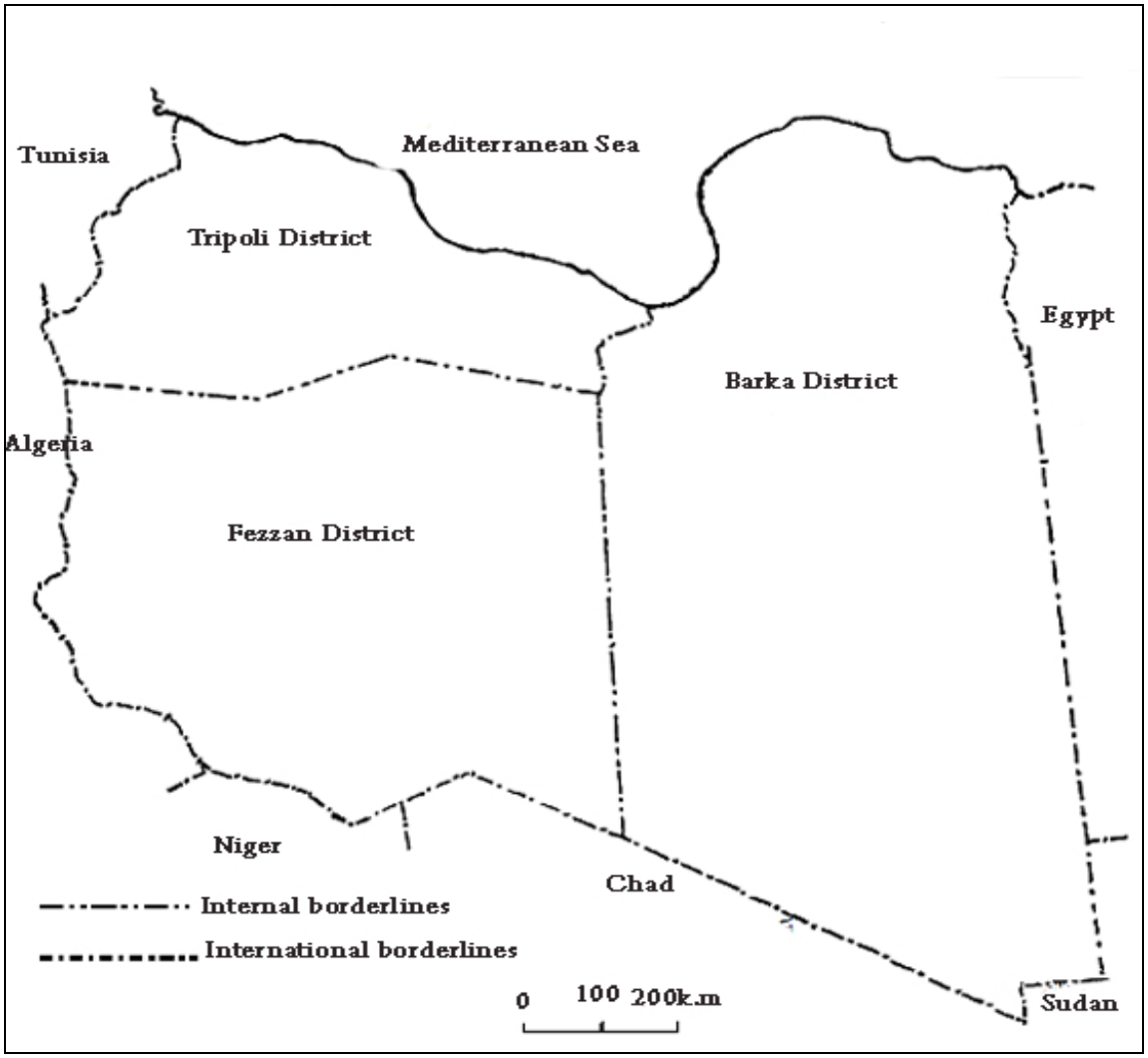


Figure 4-1: Libyan division in 1954

Source: Ministry of Planning, 1978, National Atlas, Tripoli, (Modified by the researcher)

Unlike the French, the British administration paid more attention to secular education and established non-religious vocational schools with the help of teachers employed from other Arab countries including Egypt (Nicola, 1962). This not only increased the number of schools but also pupils' enrolment. For instance, during the British administration (1943-1951), the number of schools increased from 72 to 201 while the number of pupils increased from 6718 to 32987 suggesting significant improvement in the educational system (MoE, 1974). More significant in this era is the emphasis laid on female education and

opportunities given to female students (MoE, 1999). This was partly because of the co-operation and support of many Egyptian wives of Libyans, who tried to nurture and spread female education. This led to the establishment of a teacher training college for women in 1950 and a dramatic increase in the numbers of female teachers (Nicola, 1962).

4.2.4 Education in the monarchy era (1951 – 1969)

By now it was recognised that education was a continuing challenge for the Libyan authorities. Consequently the government of post-independence Libya made significant reforms in the system (Alter, 1980). In 1952 for instance, the education law No.5 was adopted (Al Komati, 1978). The law not only gave everybody the right to education but also made education compulsory in the primary and elementary schools as well as free through every stage of education all over Libya. Accordingly, more schools, both primary and elementary, were built around the country. As a result, the number of primary school pupils increased from 32115 in 1951 to 270617 in 1968, while the number of elementary school pupils increased from 2585 in 1951 to 29181 in 1968. Of equal importance the number of teachers increased from 1028 in 1951 to 9161 in 1968 (MoE, 1999, 58). Anticipating the potential number of school leavers who may qualify to enter university, Libya's first university which formed the foundation of the "Libyan University" was established in Benghazi immediately after independence in 1951. This was mainly for the training of teachers for intermediate and secondary education levels, and training of employees for various government jobs (El-Hawat, 2003). It was called the

Faculty of Arts and Education and was followed in 1957 by the establishment of the Faculty of Science in Tripoli. In 1957, the Faculty of Economics and Commerce was founded, followed by the Faculty of Law in 1962. In 1966, the Faculty of Agriculture was established. By 1967, the Libyan University was expanded by taking control of both the Faculty of Higher Technical Studies and the Higher Teachers Training College (El-Hawat, 2003).

The increase in pupils and teachers may be explained by the higher allocations for education at that time; the increased income after the discovery of oil led to increased spending on education. Where the education budget in 1954 had been about 599,000 Dinars (about 9.6% of the overall national budget), it increased in 1966 to 17,890,000 Dinars (about 22% of the overall budget) (Abdul-Aziz at el, 1967).

Despite, the educational reforms made during the monarchy era, the system continued to face challenges. For instance, 86.7 % of the school population was as yet still in the primary schools. Also, technical education had not been encouraged nor did teachers' training centres have enough Libyan teachers. Instead, the centres relied heavily on non-Libyan teachers including those from Egypt. Moreover, small Quranic primary schools with traditional syllabuses were seemingly attracting more students each year than expected (El-Mogherbi, 1978).

4.2.5 Education in the Al-Gaddafi era (1969 – present)

Nonetheless, the 1969 revolution marked a turning point in the Libyan educational system with increasing number of schools/classrooms and students at all levels (Ganous, 1995). In higher education, for instance, in 1970 the Faculty of Medicine was established and the Islamic University in Al-Bayda was made part of the Libyan University under the name of the Faculty of Arabic Language and Islamic Studies. This was followed by the establishment of the Faculty of Oil and Mining Engineering in 1972 (El-Hawat, 2003). In 1973, the Libyan University was separated into two independent universities, which later became the University of El-Fateh in Tripoli and the University of Gar-Yunis in Benghazi. To cope with the increasing number of students in higher education since 1981, universities were expanded to 13 by 1995, consisting of 76 specialized faculties and more than 344 specialized scientific departments (El-Hawat, 2003).

In the period of 1970-1986 nearly 32,000 primary, secondary and vocational classrooms were constructed, while the number of teachers rose from nearly 19,000 to 79,000. The added space and increased teachers greatly improved student-teacher ratios at pre-primary and primary levels, although these rising enrolments in general secondary and technical education increased the ratio of students per classroom at those levels. According to the Federal Research Division of the Library of Congress, by 1986, the total enrolments of students at all levels rose to 1, 245, 000, of whom 670,000 (54%) were males and 575,000

(46%) were females; suggesting that one-third of the population was enrolled in some form of education at that time (Federal Research Division, 2009).

Table 4.1 shows the evolution in numbers of students particularly females in basic stage (Primary and Elementary) from 1969 to 2006. Pupils increased from 456916 in 1969 to 1,082,712 in 2006. Among female enrolment the percentage increased from 24% in 1969 to 32% in 1986 and 48.5% in 2006. Fig. 4.2 shows that by 2006 half of all pupils were female. In recent years the gap between male and female has disappeared in all levels of education. This has been influenced by the educational policies adopted since 1969, aimed at reducing the rate of illiteracy across the country.

Table 4.1: Number of pupils in basic education (Primary and Elementary) 1960/1999

Study year	Number of pupils		Total	% of females
	Males	Females		
69/1970	347162	109754	456916	24.02
75/1976	668525	291218	959743	30.34
80/1981	818550	377753	1196303	31.58
85/1986	1036446	489045	1525491	32.06
90/1991	1175229	558477	1733706	32.21
95/1996	1460442	715617	2176059	32.89
98/1999	1160315	576676	1736991	33.20
05/2006	557924	524788	1082712	48.5

Source -Ministry of Education, 1999, 142 -NAID, 2009,102

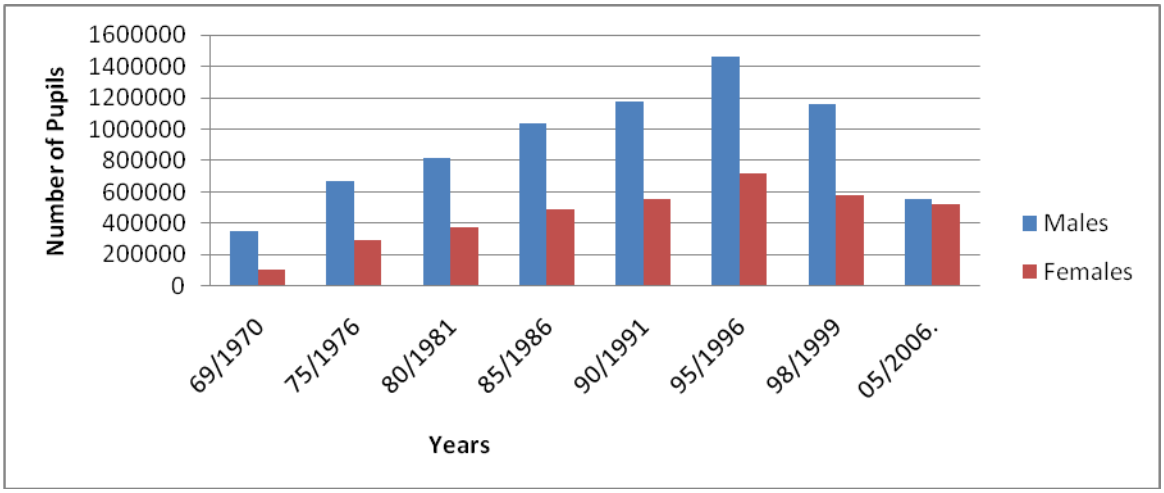


Figure 4-2: Number of pupils in basic schools

In addition; the number of students in higher education, including universities and higher technical institutions, increased from 13,418 students in 1975–76 to 269,302 during 1999–2000 and to 215,455 in 2006 academic years as illustrated by figure 4.3.

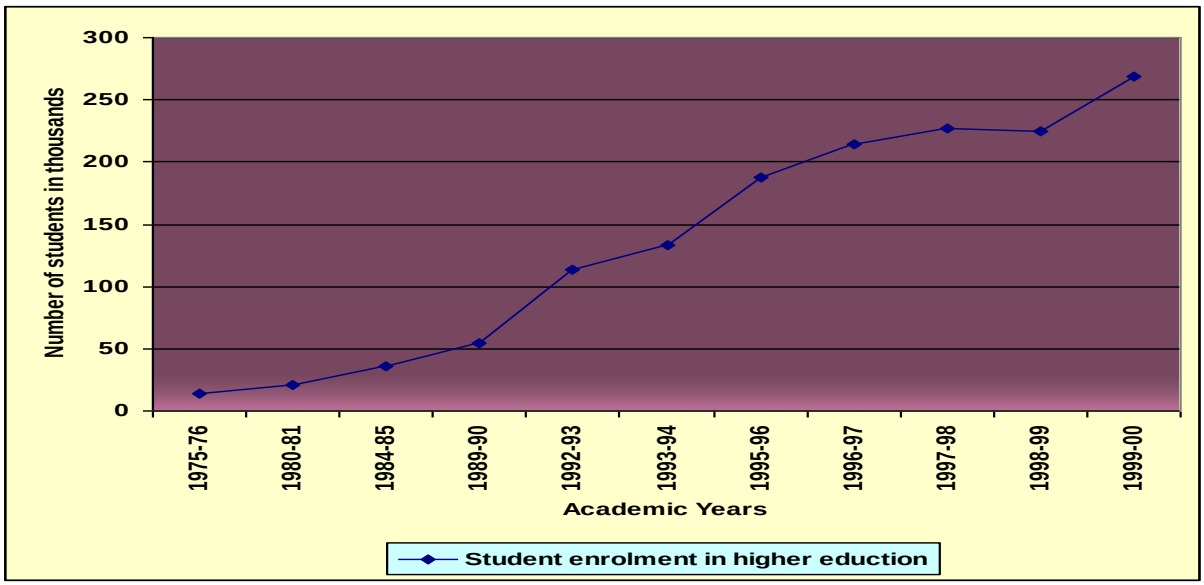


Figure 4-3: Student enrolment in higher education in Libya 1975 –2006
Source: Adapted from El-Hawat, 2003

A contributing factor to the increased student enrolment in Libya was government educational policy. For instance, education was free at all levels and university students received substantial stipends; hence there was an incentive for learning especially for children of larger families. School attendance was compulsory between the ages of six and fifteen or until completion of the preparatory cycle of secondary school. With a few exceptions, higher educational institutions in Libya are fully financed by the public budget. In 1998, for instance, the education budget represented 38.2% of the national budget; whereas in 1992 the education budget is estimated to have been approximately 0.4% GNP (Federal Research Division, 2009); emphasizing the importance placed on education by the Gaddafi government.

One far-sighted component of the Libyan education policy is the way it has positively transformed the gender disparity in education. For instance, in the period of 1954-1955 males represented 82% and females 18% of students educated at all levels in Libya. During the academic year 1999-2000, female students reached 51%; in 2006 in addition to female students enrolled in higher technical institutes and university this percentage had reached 55% (NAID, 2009).

Overview of this transformation of female education may be had from comparing the 1973 and 2006 academic years: Figures 4.4 and 4.5 illustrate the disappearance of the gender disparity with males higher than females in all levels of education in 1973; while Figure 4.5 shows that in 2006 females

enrolled in different levels of education seem to be equal to males and higher at the university stage.

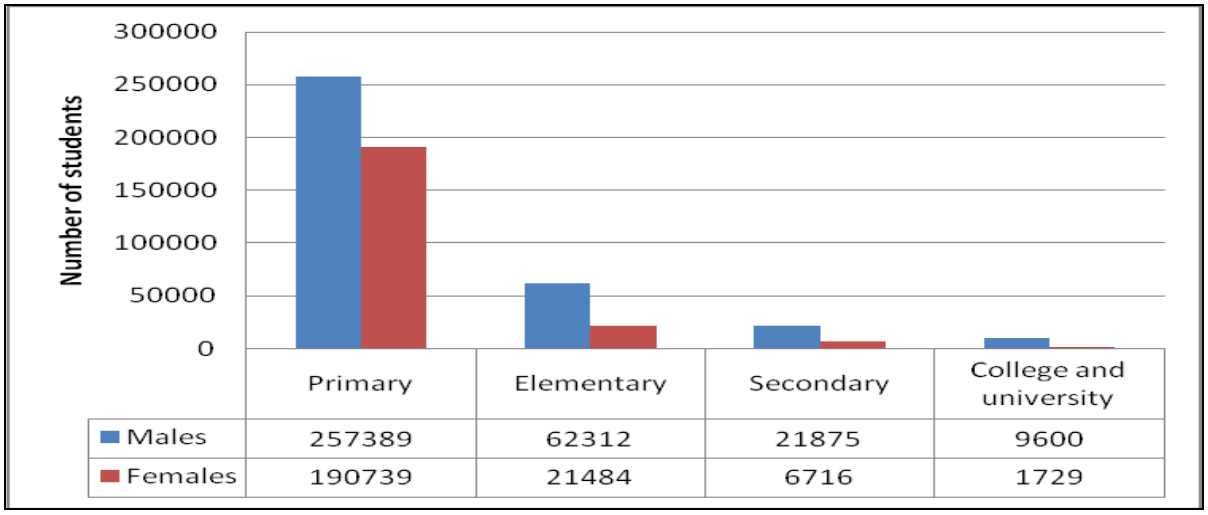


Figure 4-4 : Libyan population aged 6-30 years by enrolment status 1973
Source: MoP, 1977

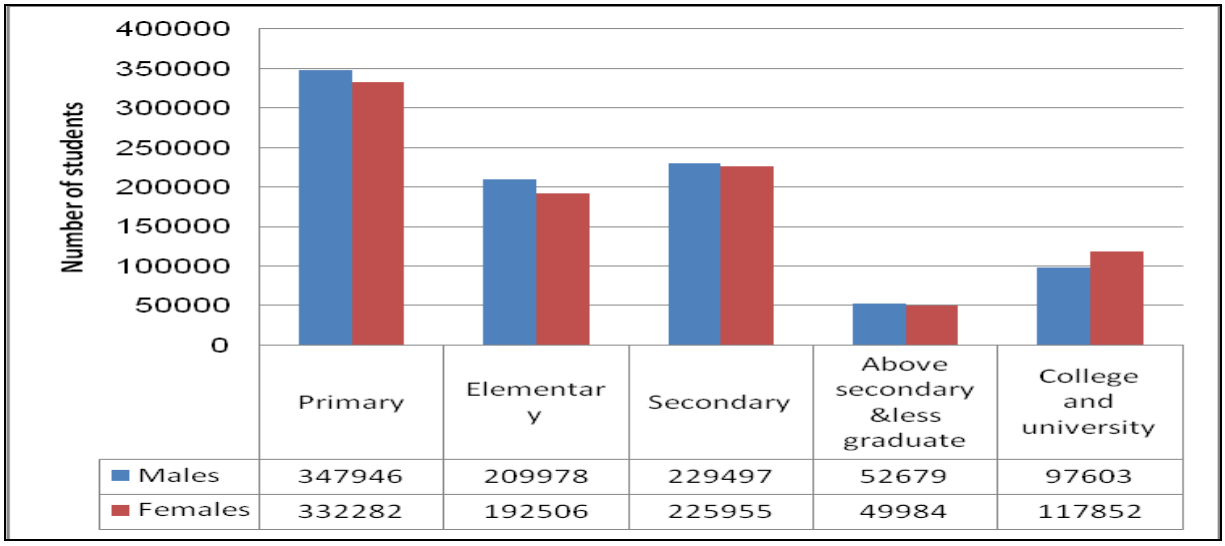


Figure 4-5: Libyan population aged 6-30 years by enrolment status 2006
Source: NAID, 2009.

Further interesting information of female education improvement is observed by comparing the percentage for females in different levels of education in 1973 and 2006 (Figure.4.6).

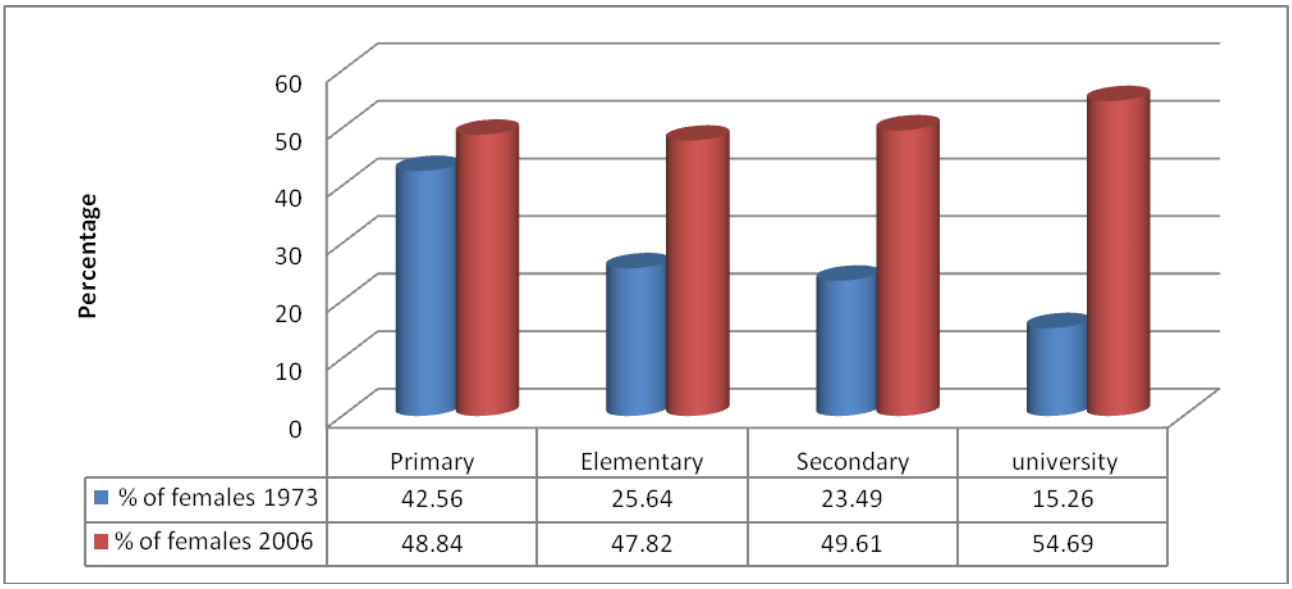


Figure 4-6: The percentage of females in various stages of education in 1973 and 2006

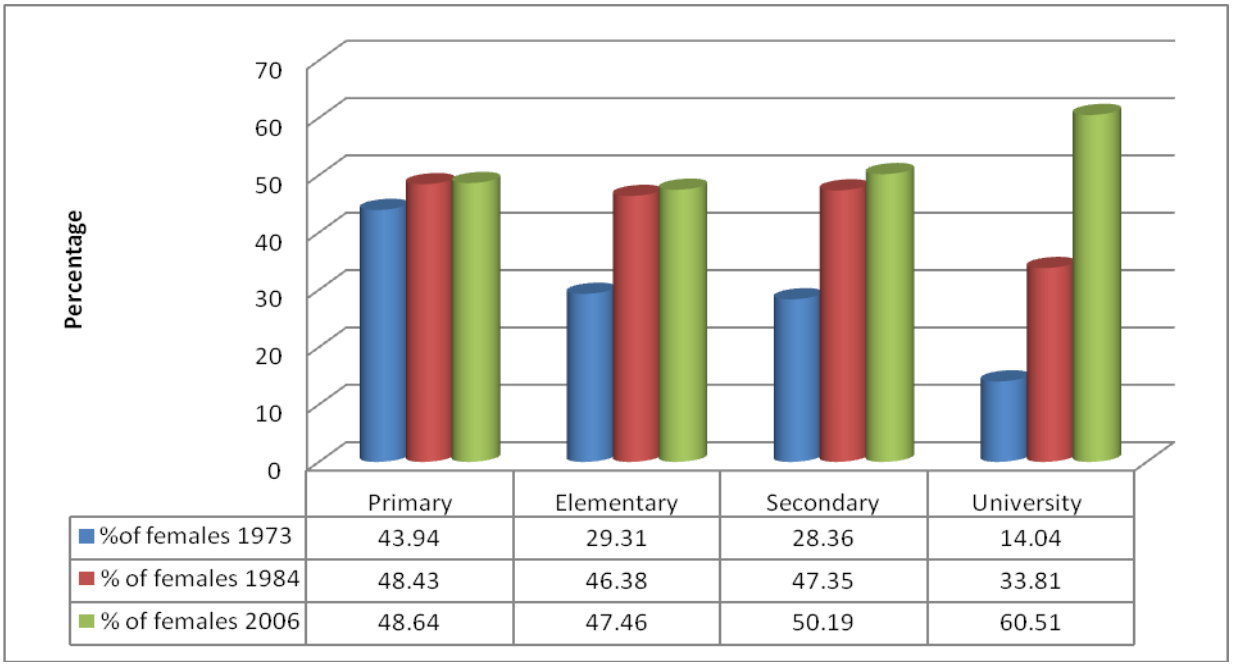
Source: MoP, 1977 and NAID, 2009.

Unarguably, there was a huge change in the proportion of female enrolment in various levels of education through the period 1973-2006. The proportion of females increased significantly in the elementary stage from 25% in 1973 to 48% in 2006, as well as in secondary stage from 23% to 50%. There was a dramatic increase in the university stage from 15% in 1973 to 55% in 2006.

The figures for the main study area of El Gebel El Akhadar reflect the wider national picture of educational development. Like other Libyan regions, El Gebel El Akhadar was affected by huge investment projects after the oil boom. Therefore it is not surprising that the number of pupils increased significantly from 18,964 in 1973 to 71,229 in 2006 (MoP, 1977 & NAID, 2009).

The proportion of females attending schools increased significantly between 1973 and 2006. This was particularly so at the stage of university (Figure 4.7)

where the percentage of university females increased from 14 % in 1973 to 34% in 1984 and to 60% in 2006.



	Primary	Elementary	Secondary	University
%of females 1973	43.94	29.31	28.36	14.04
% of females 1984	48.43	46.38	47.35	33.81
% of females 2006	48.64	47.46	50.19	60.51

Figure 4-7: Percentage of female enrolment in education 1973-2006 in El Gebel El Akhdar

Source: MoP, 1977; 1984 & NAID, 2009.

In conclusion, existing evidence indicates that there were more females (55%) enrolled at university level than males in 2006. This implies that in Libya today almost all females in most fertile reproductive years, below 30 years, are educated to basic, intermediate or university level. This is also evident in terms of illiteracy trends.

4.3 TRANSITION IN ILLITERACY IN LIBYA

The period prior to 1950 before oil was discovered in Libya, was marked by poverty. Libya was described as one of the poorest countries and it depended heavily on foreign assistance (Hamdan, 1973). Poverty was further worsened by the effect of the Second World War. Access to education was limited, resulting in low literacy rates. It has been estimated that more than 90 % of the population had no education and were illiterate (NAID, 1999, 146).

The discovery of oil in the mid 1950s in Libya transferred the situation. By 1973, illiteracy had reduced to 61% of total population; but for women it was still 85.2%, and for men 38.7% (MoEC, 1958 & MoP, 1977). By 1984, it was 23.1% among males and 57% among females (MoP, 1984). By 1995, it only 13% of total population was illiterate (8.2% among males and 18% among women (NAID 1997)). In the last census (2006), there is a clear picture of the effect of the spread of education, particularly female education. Illiteracy had declined to 11.5% of the total population (6.2% among males and 16.8% among females (NAID, 2009)).

Unquestionably, Libya has achieved great progress in education development, particularly female education. The decline of female illiteracy from 93% in 1954 to 17% in 2006 is a great indicator that the goal of reducing gender disparity and widening the spread of education has been achieved.

The rate of illiteracy in the study area of El Gebel El Akhadar was similar to the rate of illiteracy in Libya as a whole. It was 70% among females in 1973,

declined to 47% in 1984 (27.83 % among males and 65.38% for females). A huge decline has taken place in recent years. By 2006 illiteracy was recorded as only 10.04% among both sexes (4.88 % among males) and 15.23% among females (MoP, 1977 & 1984 and NAID, 2009)).

4.4 THE IMPACT OF THE EDUCATIONAL TRANSITION

The increase of female education in Libya has had a significant impact on the country's demographic transition and fertility decline. Five main effects can be identified. Firstly, the benefits of educating women range from increased productivity, economic development, and increased female autonomy as well as better health and reduced fertility. Better-educated women experience lower levels of morbidity, mortality and disability and have fewer children (Ross & Mirowsky, 1999; Doornbous & Kramhout, 1990).

Secondly, educated women are more likely to seek medical care, ensure their children are immunized, be better informed about their children's nutritional requirements, and adopt more improved sanitation practices than their counterparts (World Bank, 2009). As a result, their infants and children have higher survival rates and tend to be healthier and better nourished.

Thirdly, women with formal education tend to have better knowledge about health care practices, are less likely to become pregnant at a very young age, tend to have fewer, better-spaced pregnancies, and seek pre- and post-natal care; hence there is a reduction in maternal mortality rates (Yousif et al, 1996).

Fourthly, girls' education tends to slow and reduce the spread of HIV/AIDS by contributing to female economic independence, delayed marriage, family planning, and work outside the home, as well as conveying greater information about the disease and how to prevent it (Diamond et al, 1999; Pande et al, 2005; Caldwell, 1994; Gursoy, 1994).

Finally, education has been perceived to increase women's labour force participation rates and earning; has led to increased productivity for employers and also yields benefits for the community and society (Diamond et al, 1999).

There is no doubt that Libya has achieved many of its educational targets. Educational prevision has been disseminated across the country. Great advances have been achieved especially in the post-oil period. This has not only been reflected in the disappearance of a disparity between female and male enrollments but also in the proportion of female enrollments at different levels in the education system including in higher education.

Major improvements in health facilities obviously often account for lower infant mortality rates and higher life expectancy. But arguably it is the connection between female education and total fertility rates that has caused the biggest transition in Libya from 8.0 children per women in 1973 to 3.3 in the period 2000-2008 (MoP, 1977 & NAID, 2009). The effect of education transition on fertility behaviour is explored in much more detail and using analytic methods in chapters that are to follow.

5 CHAPTER FIVE: FERTILITY TRANSITION IN EL GEBEL EL AKHDAR

5.1 INTRODUCTION

In Libya in general, and in the study area of El Gebel El Akhdar in particular, fertility levels have experienced a downward trend over recent decades. The transition has, however, happened markedly later than in most countries of the global south (Casterline, 1991& 2001; Chackiel and Schkolnik, 1996). In El Gebel El Akhdar the Crude Birth Rate fell from 56 per thousand in 1973 to 24 per thousand in 2004, representing by any standard a remarkably rapid fertility transition. But when did it happen and how even was the pattern of fertility decline? It is the purpose of this chapter to examine the pattern of fertility change in a rigorous fashion, not only as a basis for the analytic work of later chapters (which will try to offer an explanation of fertility trends in the study area), but as a means of comparing Libya's experience with that of other countries. This chapter is based on primary data collected by the author through a survey conducted between October 2008 and February 2009, complemented by census data for the years 1973 and 2006.

This chapter is organized into two main sections which include various sub-sections. They aim to provide a benchmark for analytic work in later chapters by describing the nature of fertility variations. The next section includes various techniques for measuring fertility transition in the study area such as general fertility rate, age specific fertility rate, marital fertility rate, period and cohort

fertility, parity progression ratio, gross reproduction ratio, child women ratio, total fertility rate.

These techniques are used for multiple-purposes; each technique has certain functions which distinguish it from others. For example, GFR is used to measure fertility among those at risk of given births (women in age group 15-49), while TMFR measures fertility within marriage, and TFR measures the average of children that women might bear or have during her reproductive life and so forth.

The second section examines Woods' model of spatial fertility variations (Woods, 1979) and provides a context for understanding fertility change in El Gebel El Akhdar. It explores the change of fertility and the spatial variation in fertility across Libyan regions. An examination is attempted of spatio-temporal fertility trends in relation to a schematic model to explain what stage of the transition Libya has reached relative to a global framework for thinking about fertility transition.

5.2 TECHNIQUES OF MEASURING FERTILITY TRANSITION IN THE STUDY AREA

The following discussion focuses on fertility behaviour in El Gebel El Akdhar from 1970 onwards. The many techniques used in this chapter include those referred to Bongaarts' model as introduced in chapter 2 (Figure 2.1).

5.2.1 General fertility rate

The General Fertility Rate is obtained by dividing the total live births by the total number of women at risk of giving birth (15-49 years old).

The formula of GFR is:

$$GFR = \frac{TB}{nfx} * 1000$$

TB = The Total live births
nfx = females aged x-x (15-49)

In the current survey, all the women were married and as a result the (GFR) statistics cannot be compared with those in other studies. They are however useful for internal comparison. In other words; they were at risk of giving birth. However, they had been married for different lengths of time. Some of them for example in the 1970s were not married because they were younger, while women in the sample who were 45 years old or older were no longer in the fertile years at the time of the survey. As a result the statistics in Table 5.1 are based on only those women of the relevant age and marital status in the years under consideration.

5.2.1.1 General fertility rate in El Gebel EL Akhdar

Table 5.1 shows that the GFR was very high in El Gebel El Akhdar in the 1970s and 1980s; it was 289 and 254 per thousand respectively. The GFR declined in the 1990s and 2000s to 182 and 117 per thousand respectively.

Table 5.1: General fertility rate (000) in El Gebel El Akhdar, 1978-2008

Year	1978	1988	1998	2008
Urban	258.50	241.38	156.49	117.37
Rural	320.00	266.99	208.66	117.12
Both Urban & Rural	289.56	254.28	182.17	117.24

Source: Calculation done by researcher

5.2.1.2 Spatial variation in the general fertility rate

Table 5.1 and Fig. 5.1 indicate the variation of GFR between rural and urban areas. There was an effect of space and place in fertility behaviour where GFR was higher in rural areas than urban regions (320 and 258 respectively in 1978). Although GFR declined in both rural and urban areas a differential remained until the end of the 1990s. One of the tasks of the next chapter will be to explore the roles of age at marriage and literacy in accounting for these differentials as well as to understand why by 2008 there was no longer any significant difference. At this point we can only speculate concerning the potential role of education, particularly amongst women, and the influence of compulsory education up to the age of 15 in changing thinking about fertility.

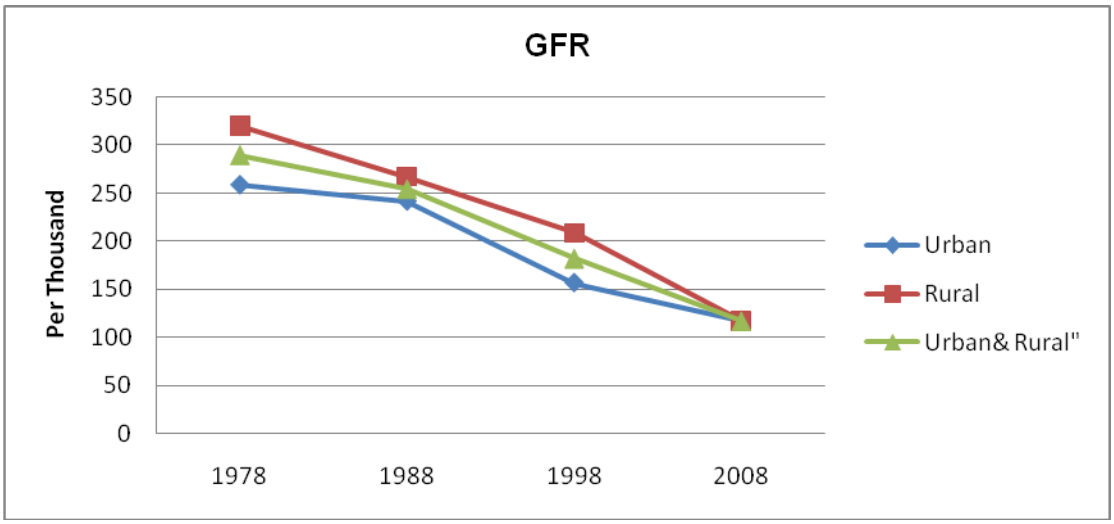


Figure 5-1: General fertility rate per thousand in EL Gebel El Akhdar, 1978-2008
Source: Calculation done by researcher

In the above discussion we have concentrated on births by all married women at risk of giving birth. We turn now to examining the age specific fertility rate.

5.2.2 Age specific fertility rate

The age specific fertility rate is one of the most important measures of fertility (Weeks, 2005). Age specific fertility rates indicate the probability of women of different ages giving birth. "It requires a rather complete set of data, births according to the age of the mother and a distribution of the total population by age and gender. An age specific fertility rate (ASFR) is the number of births occurring annually per 1,000 women of a specific age (usually given in 5-year age groups: 15-19, 20-24… 45-49" (Ghani, 2006, 2).

The age specific fertility rate is expressed as:

$$nfx\frac{nBx}{nFx}.1{,}000$$

nfx = the age-specific fertility rate of females age x to x + n
nBx =live births to females aged x to x +n
nFx = females aged x to x +n
n =number of years in each age group (usually 5)
x = takes on the values, 15,20,25,30, 35 ...49
(Woods, 1979, 108)

5.2.2.1 Age specific fertility rate in El Gebel El Akhdar

Table 5.2 shows the different patterns of childbearing across each age group. The age specific fertility rate was higher among age group 15-19 in 1978 when comparing it with subsequent years - about 197 per thousand. The peak age specific fertility rate in 1978 was among the 20-24 age groups (484) births per 1000 women in the cohort. This is a suspiciously high rate which may be affected by the small size of the cohort and the effect of the exclusion of unmarried women in the 1970s. By 1988 there was a slight decline among the 15-19 age groups and an increase in fertility in the 20-24 age groups and the 30-34 age groups (361 and 378 respectively). The ASFR remained high in 1998 among 30-39 year olds, but women also showed signs of having their children later than before.

In 2008 when the survey was being conducted 300 of the females studied were younger (45 and less), many of them being in their early marital life. The age specific fertility rates indicate high increases in age cohorts 20-29, with a significant reduction in the level of fertility in later years. This apparent

reversal in the patterns of ASFRs may seem surprising, but would not be totally incompatible with a widespread adoption of contraceptive measures to reduce unwanted fertility amongst women in the later part of their reproductive life.

Table 5.2: Age specific fertility rate (ASFR) (1000) 1978-2008

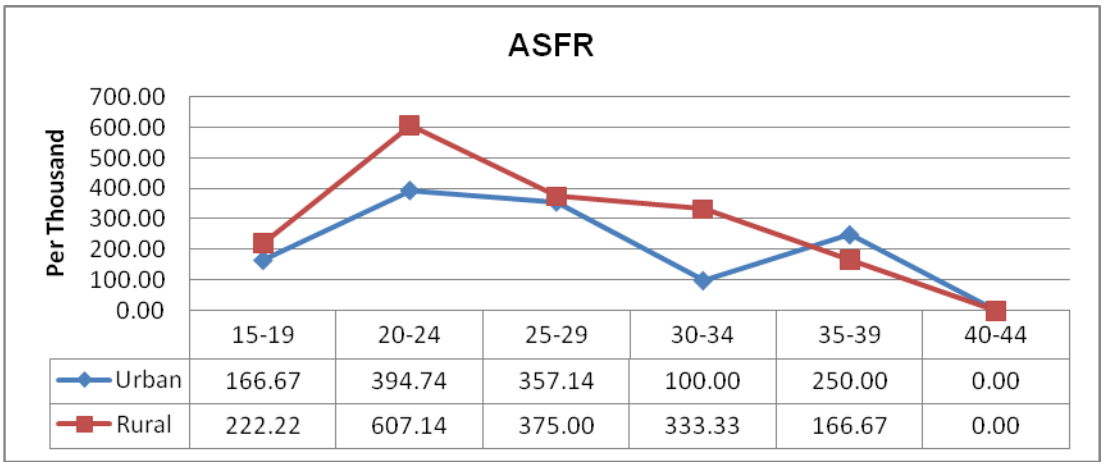
Age band		15-19	20-24	25-29	30-34	35-39	40-44	45-49	Total
ASFR in 2008	Urban	0.00	333.33	333.33	135.14	85.71	88.24	0.00	975.75
	Rural	0.00	300.00	185.19	241.38	128.21	142.86	0.00	997.64
	Both	0.00	318.18	263.16	181.82	108.11	118.42	0.00	989.69
ASFR in 1998	Urban	0.00	81.08	210.53	476.19	300.00	52.63	0.00	1120.43
	Rural	0.00	236.84	217.39	133.33	388.89	142.86	0.00	1119.31
	Both	0.00	160.00	214.29	333.33	348.48	90.91	0.00	1147.01
ASFR in 1988	Urban	78.95	333.33	316.67	368.42	214.29	0.00	0.00	1311.65
	Rural	86.96	400.00	319.44	392.86	333.33	200.00	0.00	1732.59
	Both	83.33	361.11	318.18	378.79	269.23	120.00	0.00	1530.64
ASFR in 1978	Urban	166.67	394.74	357.14	100	250.00	0.00	0.00	1268.55
	Rural	222.22	607.14	375.00	333.33	166.67	0.00	0.00	1704.37
	Both	196.97	484.85	365.38	240.00	214.29	0.00	0.00	1501.49

Source: Calculated by author.

5.2.2.2 The spatial variation of age specific fertility rates (rural & urban areas)

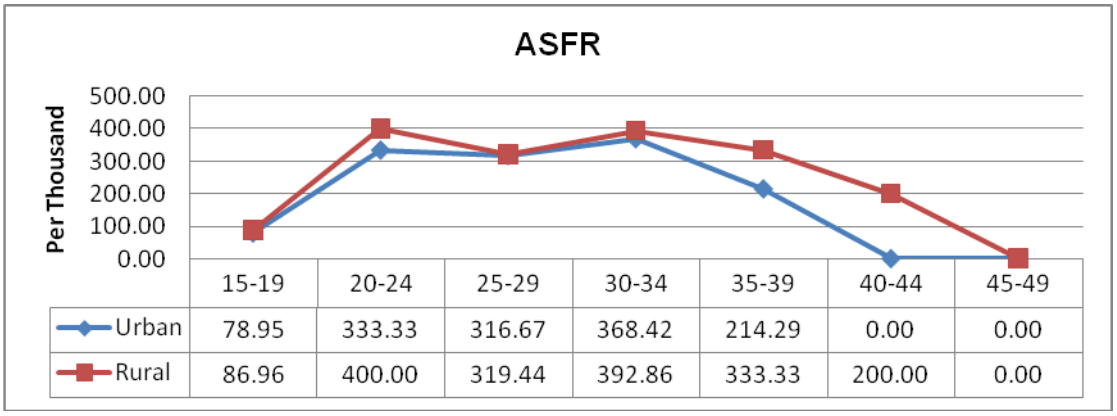
Figures 5.2-5.5 show the expected differentials between rural and urban populations across the decades, with young women in the 20-24 cohorts in rural areas having particularly high ASFRs in 1978. This differential disappears by 1988, but rural women continue to have more children in the later part of

their reproductive life. By 1998 the ASFR curve for the urban population has already adopted the pattern that is later to be typical of the entire population with a significant decline in births amongst the 35-49 age groups. By 2008 the downward shift of the peak ASFR in the 20-29 cohorts is evident in the urban population; the rural ASFR curve by this time conforms to the same general pattern.



	15-19	20-24	25-29	30-34	35-39	40-44
Urban	166.67	394.74	357.14	100.00	250.00	0.00
Rural	222.22	607.14	375.00	333.33	166.67	0.00

Figure 5-2: The age specific fertility age in rural and urban areas in1978



	15-19	20-24	25-29	30-34	35-39	40-44	45-49
Urban	78.95	333.33	316.67	368.42	214.29	0.00	0.00
Rural	86.96	400.00	319.44	392.86	333.33	200.00	0.00

Figure 5-3: The age specific fertility age in rural and urban areas in1988

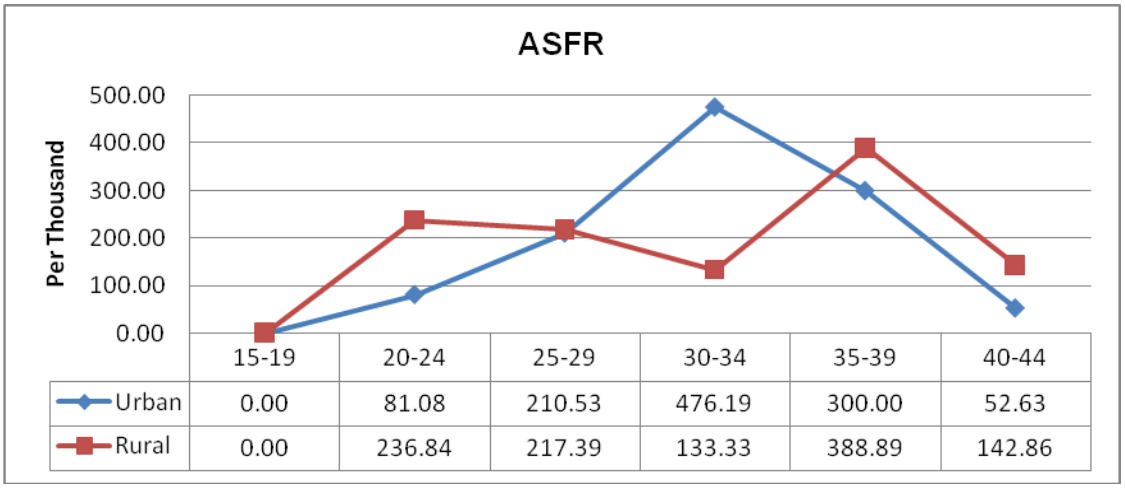


Figure 5-4: The age specific fertility age in rural and urban areas in1998

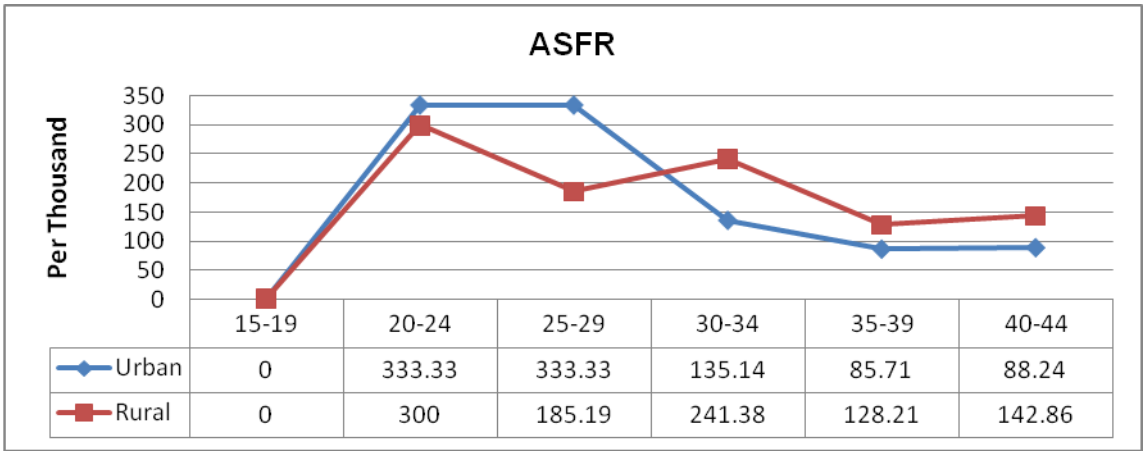


Figure 5-5: The age specific fertility rate in rural and urban areas in 2008

Table 5.3 and Fig 5.6 show the wider context of age specific fertility rates for the whole of Libya. As in El Gebel El Akhdar, the ASFRs for younger cohorts are much higher in the 1970s. There are however some significant differences. The national pattern shows that ASFR was higher in 1970s in age group 15-19 comparing it with the subsequent years and the peak was in age group 20-29. While in recent years, particularly since the early 1990s so far, ASFR tends to peak later in age group 30-34. This means that there is a change in female behaviour in terms of delay of age at first marriage as women prioritise finishing their higher education and getting jobs ahead of marriage. This could

explain why fertility is low in age group 15-29. Also, it is indicator of use of contraceptive methods which could explain why fertility is low in age group (39-49).

Table 5.3: The Age specific fertility rate in Libya in 1973, 1995-2010

Period	15-19	20-24	25-29	30-34	35-39	40-44	45-49
1973	201	334	328	241	161	65	31
1995-2000	4.91	57.92	160.45	211.96	159.91	72.86	14.19
2000-2005	3.88	49.51	147.26	198.71	141.38	55.57	9.70
2005-2010	3.16	43.09	135.76	186.10	126.67	43.42	6.59

Source: United Nation 2010, http://esa.un.org/unpp/

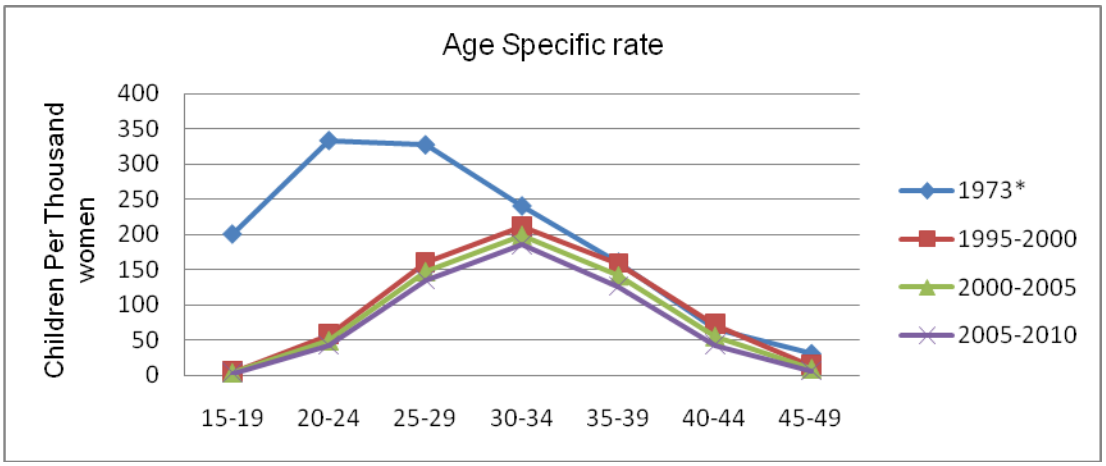


Figure 5-6 The Age specific fertility rate in Libya in 1973 and 1995-2010

5.2.3 Marital fertility rate

Marital fertility rates relate to women who are married and measure births only within this specific group of women. "TM is the number of births a women would have at the end of the reproductive years if she were to bear children at prevailing age-specific marital fertility rates and to remain married during the entire reproductive period (based on the fertility of married women aged 15-45)" (Bongaarts, 1978, 108).

Table 5.4 shows that total marital fertility (TM) was 10 children per married woman in 1971. There was a slight increase by 1981 (11.39) followed by a decline in 1991 (6.09). TM allows us to measure the effects of changes in fertility behaviour within marriage and in attitudes towards the control of family size. In particular TM proved an interesting measure when the fertility of older women (over 45) was compared with those still in the productive age cohorts. Not surprisingly TM was lower for the younger age group (Table 5.5).

Rural and urban differentials were also observed for TMFRs. For women who had completed their child bearing by the time of the author's survey, the TMFR for rural and urban populations fell from 10.6 and 8.3 respectively in 1971 to 6.7 and 5.7 in 1991 (Table 5.4). For younger women (45 and less in 2001) fertility histories were also studied to compare the effects of marriage during the last decade (Table 5.5). For this younger group only half were married by 2001. For this group TMFRs were a little higher in rural areas than urban in 2001 (6.6 versus 6.4) while in 2006 the urban women in the sample actually had a slightly higher rate than rural (5.9 versus 5.4).

Table 5.4: Marital fertility rate for women over 45 years old between 1971 and 1991

Combined Urban& Rural 1971	Age band	15-19	20-24	25-29	30-34	35-39	40-44	45-49	Total
	Married women	33	27	23	6	4	0	0	93
	Births	14	21	12	2	0	0	0	49
	MASFR	424.24	777.78	521.74	333.33	0.00	0	0	2057.09
	TM								10.29
Urban 1971	Married women	16	14	10	3	1	0	0	44
	Births	7	10	5	1	0	0	0	23
	MASFR	437.50	714.29	500.00	0.00	0.00	0	0	1651.79
	TM								8.26
Rural 1971	Married women	17	13	13	3	3	0	0	49
	Births	7	11	7	1	0	0	0	26
	MASFR	411.76	846.15	538.46	333.33	0.0	0.00	0.00	2129.71
	TM								10.65
Combined Urban& Rural 1981	Married women	28	71	52	35	20	5	2	213
	Births	10	40	22	11	7	1	0	91
	MASFR	357.14	563.38	423.08	314.29	350.00	200.00	0.00	2207.89
	TM								11.04
Urb an1981	Married women	12	35	30	17	8	2	1	105
	Births	5	18	13	6	3	0	0	45
	MASFR	416.67	514.29	433.33	352.94	375.00	0.00	0.00	2092.23
	TM								10.46
Rural 1981	Married women	16	36	22	18	12	3	1	108
	Births	5	22	9	5	4	1	0	46
	MASFR	312.50	611.11	409.09	277.78	333.33	333.33	0.00	2277.15
	TM								11.39
Combined Urban& Rural 1991	Married women	0	0	60	85	52	26	16	239
	Births	0	0	21	24	10	7	2	64
	MASFR	0.00	0.00	350	282.35	192.31	269.23	125.00	1218.89
	TM								6.09
Urban 1991	Married women	0	0	28	40	30	11	6	115
	Births	0	0	10	8	4	3	1	26
	MASFR	0.00	0.00	357.14	200.00	133.33	272.73	166.67	1129.87
	TM								5.65
Rural 1991	Married women	0	0	32	45	22	15	10	124
	Births	0	0	11	16	6	4	1	38
	MASFR	0.00	0.00	343.75	355.56	272.73	266.67	100.00	1338.70
	TM								6.69

Source: Calculation done by researcher

Table 5.5: Marital fertility rate for women under 45 years old in 2001, 2006

Age band	10-14.	15-19	20-24	25-29	30-34	35-39	Total
Total no. of married women who were in these ages **in 2001**	0	6	19	50	68	22	165
Total no of births to women in these ages **in 2001**	0	2	6	16	14	3	41
ASMFR	0	333.33	315.79	320	205.88	136.36	1311.37
MTFR							6.6
Urban married women `2001	0	3	12	23	34	10	82
Urban Births	0	1	4	5	7	2	19
ASMFR	0	333.33	333.33	217.39	205.88	200	1289.94
MTFR							6.4
Rural married women 2001	0	3	7	27	34	12	83
Rural Births	0	1	2	11	7	1	22
MASFR	0	333.33	285.71	407.41	205.88	83.33	1315.671
MTFR							6.6
Age band	**15-19**	**20-24**	**25-29**	**30-34**	**35-39**	**40-44**	**Total**
Total no. of married women who were in these ages **in 2006**	9	33	55	75	79	24	275
Total no of births to women in these ages **in 2006**	1	9	18	17	10	2	57
ASMFR	111.11	272.73	327.27	226.67	126.58	83.33	1147.69
MTFR							5.7
Urban married women 2006	5	13	34	36	37	11	136
Urban Births	1	4	11	7	3	1	27
ASMFR	200	307.69	323.53	194.44	81.08	90.91	1197.66
MTFR							5.9
Rural married women 2006	4	20	21	39	42	13	139
Rural Births	0	5	7	10	7	1	30
ASMFR	0	250	333.33	256.41	166.67	76.92	1083.33
MTFR							5.4

Source: Calculation done by researcher

5.2.4 Period and cohort fertility

In the previous sections GFRs, ASFRs and TMFRs have been calculated both for women 45 and less and for women over 45 in rural and urban areas, and the investigation of fertility rates has examined the transition of fertility both for women who are still giving birth as well as for those who have completed their fertile years.

Although demographers offer many measures of fertility, the total fertility rate (TFR) is used more often than any other indicator, but in fact it measures the average of births that women may bear or give in their reproductive life, so no

real group of women has experienced or will necessarily experience these particular rates (Bongaarts et al, 1998). The actual childbearing of cohorts of women is given by the completed fertility rate (CFR), which measures the average number of births 50-year-old women had during their reproductive years. Although the CFR measures the true reproductive experience of a group of women, it has the disadvantage of representing past experience: women currently aged 50 did most of their childbearing two to three decades ago when they were in their 20s and 30s while TMFR can measure current fertility (Bongaarts, 1998, 271). Therefore, in the following discussion we will concentrate on those who had finished giving birth by using the period and cohort approaches to find out about historical changes in fertility rates.

5.2.4.1 Period age specific fertility rate

The age specific fertility rate for women over 45 in El Gebel El Akhdar in 1980 is shown in Table 5.6 and Figure 5.7. Inevitably cell numbers are low because of the overall sample size, but the results are nevertheless interesting. In 1980 fertility was highest when this group was in the 30-34 age groups (about 459 children per thousand women). In general, however, it can be seen that ASFRs were at their highest rate across the child-bearing years from 20 to 39.

5.6: Period age specific fertility rate in 1980

Combined 1980	Age band	15-19	20-24	25-29	30-34	35-39	40-44	45-49
	ASFR	156.63	382.02	396.55	459.46	409.09	250.00	0.00
	TFR							10.3
Urban 1980	ASFR	108.11	361.70	406.25	421.05	500.00	250.00	0.00
	TFR							10.2
Rural 1980	ASFR	195.65	404.76	384.62	500.00	333.33	250.00	0.00
	TFR							10.3

Source: Calculation done by researcher

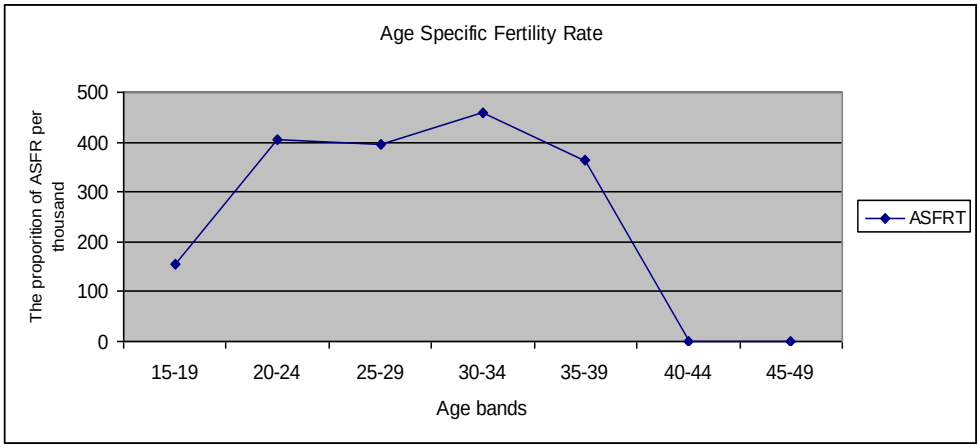


Figure 5-7 Age Specific Fertility Rates for women over 45 in 1980

5.2.4.2 Cohort total fertility rate

Cohort analysis considers the experience of one group of people over time, usually all those born or marrying during a particular time interval. It is used mainly for explaining fertility levels and trends, rather than forecasting.

In addition, cohort fertility rates measure a set of individuals who experiences period effect at the same stage of the life course. The double significance of the cohort concept makes it particularly interesting. Table 5.7 shows that cohort fertility remained fairly high for women over 45 who had completed giving birth by the time of the researcher's survey, whether living in a rural or urban area (9.1 and 8.4 respectively). For the older women (those born 1933-38) their completed fertility was very high (11.3) compared with cohort fertility of those born 1959-1963 (6.3). It was noticeable that for all these older women there had been a tendency to start child bearing early (in the 15-19 years).

The high cohort fertility among women over 45 can be attributed in general to their early age of marriage combined with the long time span of their reproductive histories. A majority of those born between 1933 and 1958 did not attend school and so were uneducated, which meant both that marriage was likely at a younger age and also that they were unlikely to practise any modern methods of fertility control within marriage. Clearly, there are incipient signs of fertility change occurring between older and younger cohorts. There was a considerable transformation in cohort fertility between the cohorts born in the 1930s and those born in the 1960s. Large families with 11.3 children appear in 1933-1938 while the figures give 6.3 children for the cohorts born in 1959-1963. The proportion of three and four-child families was increasing among recent cohorts (women of 45 and less) and there are indications that these trends are continuing. This may change in the near future.

Table 5.7: Cohort total fertility rate

Rural		Cohort Age Specific Rate (Per 1000)								
Year of birth	No. Women	15-19	20-24	25-29	30-34	35-39	40-44	45-49	Total	CFR
1959-1963	72	153	431	361	264	83	69	0	1361	6.8
1954-1958	28	250	500	429	214	250	107	36	1786	8.9
1949-1953	24	375	625	500	500	292	83	0	2375	11.9
1944-1948	15	400	733	800	400	333	267	0	2933	14.7
1939-1943	6	167	167	500	667	167	167	167	2000	10.0
1933-1938	5	400	600	400	200	200	200	0	2000	10.0
Total	150	247	507	453	320	180	107	13	1827	9.1

Urban		Cohort Age Specific Rate (Per 1000)								
Year of birth	No. Women	15-19	20-24	25-29	30-34	35-39	40-44	45-49	Total	CFR
1959-1963	63	127	429	238	238	79	32	0	1143	5.7
1954-1958	38	316	500	553	289	211	53	0	1921	9.6
1949-1953	28	321	536	429	429	250	71	0	2036	10.2
1944-1948	10	400	600	1000	400	400	100	0	2900	14.5
1939-1943	8	250	125	125	375	250	375	0	1500	7.5
1933-1938	3	333	667	667	333	333	333	0	2667	13.3
Total	150	240	467	407	307	180	73	0	1673	8.4

Combined		Cohort Age Specific Rate (Per 1000)								
Year of birth	No. Women	15-19	20-24	25-29	30-34	35-39	40-44	45-49	Total	CFR
1959-1963	135	141	430	304	252	81	52	0	1259	6.3
1954-1958	66	288	500	500	258	227	76	15	1864	9.3
1949-1953	52	346	577	462	462	269	77	0	2192	11.0
1944-1948	25	400	680	880	400	360	200	0	2920	14.6
1939-1943	14	214	143	286	500	214	286	71	1714	8.6
1933-1938	8	375	625	500	250	250	250	0	2250	11.3
Total	300	240	483	427	313	180	90	7	1740	8.7

Source: Calculation done by researcher

5.2.5 Parity progression ratio (PPRs)

More thorough investigation than previously of childbearing levels and trends by birth order may be derived from parity progression ratios which can shed some additional insights, as well as provide a basis for judgment on whether the ongoing trends of fertility decline and childbearing postponement will continue in the foreseeable future (Frejka, & Sardon, 2007). The analysis of

progression in the following discussion concentrates on those born in 1959-1963 (age 45-49 in 2008) who had already concluded their childbearing.

PPR include both age and parity so it considers insightful measures of fertility trends as well as capturing the movement of any individual parity to the next one. "When levels of progression to next birth are high (close to one), the parity progression rates increase to a level of about one half and remain more or less at this level through high durations. This pattern reflects a situation in which all women are exposed to the risk of progressing to a next birth, and in which essentially all do so within about ten years of having their previous birth. When levels of progression to next birth are low (one half or lower), parity progression rates increase with duration for the first several years, reaching a high of less than one half, and then decrease as we move to higher durations. The lower the level of progression to next birth, the lower the peak, and the more rapidly rates decline from this peak" (Griffith, 1992, 1)

In our case study, the parity progression ratio was calculated for those born between 1959 and 1963, (ie those considered to have completed their fertility). PPRs present a different perspective of fertility in El Gebel El Akhdar. Table 5.8 indicates that the progression from first to second birth is generally fairly high, but still less than one. Progression from second to third birth will generally be lower. But in this case, it is still high about 0.94. The reduction of progression probability is seen in a7 and above (Table 5.8), where it appears the lowest parity progression is achieved with the probability of having the eleventh or twelfth child at about 0.59 and 0.43 respectively.

Table 5.8: Parity Progression ratio: age cohort 45-49

Children ever born	Women	PPR	P	
1	1	135	0.993	a1
2	7	134	0.948	a2
3	11	127	0.913	a3
4	15	116	0.871	a4
5	9	101	0.911	a5
6	14	92	0.848	a6
7	25	78	0.679	a7
8	11	53	0.792	a8
9	15	42	0.643	a9
10	11	27	0.593	a10
11	9	16	0.438	a11
12	7	7		

Source: Calculation done by researcher

5.2.6 Gross reproduction ratio (GRR) and child-women ratio

GRR is obtained by multiplying the total fertility rate by the proportion of all births that are girls. It is generally interpreted as the number of female children that a female just born may expect to have in her lifetime, assuming that birth rates stay the same and ignoring her chances of survival through her reproductive years. Specifically it deals with female births in order to identify the number of mothers in future.

The formula of GRR is:

$$GRR = \sum ASFR * Bf \; / \; Bm + f \; . \qquad [ASFR = \sum \frac{ASFR * Bf}{Bm+f}]$$

B^f = *Number of female births*

B^{m+f} = *Number of male and female births i.e. all births*

The GRR in El Gebel El Akhdar in 2008 was [GRR= 4.9* 23/51= 2.2]. That means every woman will be replaced by 2.2 daughters. The rate was even higher in El Gebel El Akhdar in 1973 when it was 4.4 (MoP, 1977).

The child-women ratio is the number of children less than 5 years old (0-4) divided by the number of women in the reproductive ages (15-49) - for example; the CWR in El Gebel El Akhdar in 2006 was (23641/57679=0.409) (NAID, 2009).

The proportion of children less than five years old for women who were in the reproductive age (15-49) has declined since 1973. CWR declined from 0.1209 in 1973 to 0.918 in 1984, then to 0.410 in 2006 (MoP, 1977, 1987; NAID, 2009). It is a significant indicator of fertility transition in El Gebel El Akhdar. The decline was attributed to the change in women's circumstances with the increase in education among females and the increase in women's knowledge about contraception. Also changes in ideas about what is the ideal family size as well as the effect of occupational change.

5.2.7 Total fertility rate in El Gebel El Akhdar

The total fertility rate (TFR) is one of the most significant measurements of fertility and more powerful than CBR and GFR. It eliminates the variations due to differences in age distribution which the general fertility rate does not (Woods, 1979). "Another reason for the popularity of the TFR is its ease of interpretation compared with some other measures" (Bongaarts et al, 1998, 271).

The total fertility rate is normally defined as the average number of children a women might have over her reproductive lifetime. It is obtained by adding the age–specific fertility rates (nfx or fz) for women at each age; however, when five year age groups are employed, the total must be multiplied by five in order to estimate the sum of the rates at each individual age.

The total fertility rate is usually represented by this formula:

$$TFR = n. \left(\sum_{kZ=1}^{7} \frac{Bz}{Fz} \right)$$

n= the number of years in each age group (n=5 here).
Z= a series of age groups (here z stands for the 7 five-year age groups 15-19...)
Bz= Live births to mothers in age group z.
Fz = females in age groups z. (Woods 1979, 111)

Table 5.9 shows the TFR for urban and rural parts of the study area. In the early 1970s the TFR was 6.3 in urban areas and 8.5 in rural areas. Similar high levels were recorded in many parts of Libya as well as in other countries in North Africa (Yousif, 1996).

The TFR in El Gebel El Akhdar rose to 7.6 in 1988. This is not surprising in the Libyan context. According to the World Fertility Survey (WFS), Libya like many countries experienced an initial rise in its TFR during the early fertility transition due to the increased fecundity that accompanies the early stages of economic development. Also in North Africa in the late 1970s rural women bore on average 2.5 more children than urban women (Yousif, 1996).

Significant changes in both urban and rural areas of El Gebel El Akhdar occurred after 1988 as shown in Fig 5.8 where TFR declined to 4.8 children per women in urban regions and 4.9 children in rural areas. The TFR not only declined between 1988 and 2008, but there was also a convergence of rates between places (Fig 5.8), in line with the spatial model of fertility transition proposed by Woods (1979).

Table 5.9: Total fertility rate in rural & urban areas in study area between 1978 & 2008

Year/ Region	TFR
Total fertility rate of rural/urban women in 2008	4.9
Urban Women	4.8
Rural women	4.9
Total fertility rate of rural urban women in 1998	5.7
Urban Women	5.6
Rural women	5.6
Total fertility rate of rural urban women in 1988	7.6
Urban Women	6.5
Rural women	8.6
Total fertility rate of rural urban women in 1978	7.5
Urban Women	6.3
Rural women	8.5

Source; Calculation done by researcher

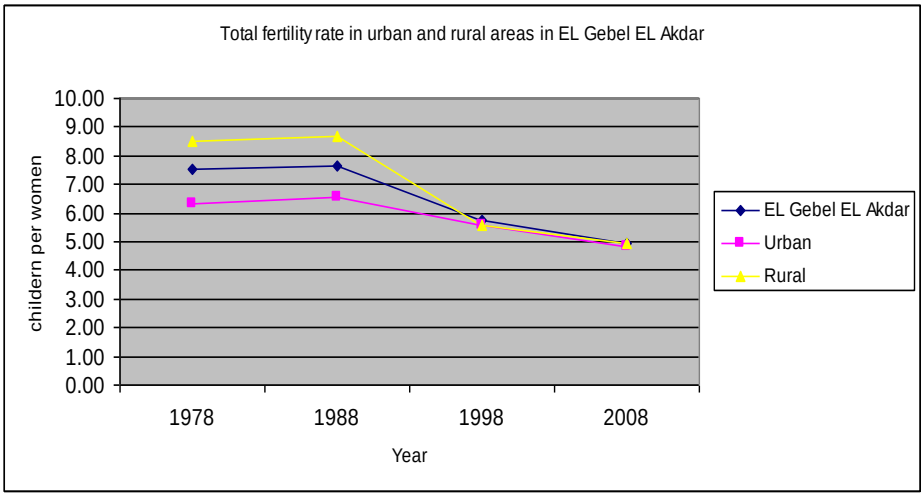


Figure 5-8: Total Fertility Rates in rural and urban areas, 1978-2008

According to the official Libyan Census, the TFR declined from 8 children per woman in 1973 to 3.3 in 2006 in Libya as a whole. In El Gebel El Akhdar it declined from 8.5 children per woman in 1973 to 4.5 in 1995 (MoP, 1977; NAID, 1997 & 2009).

5.3 FERTILITY CHANGE IN LIBYA: A CONTEXT FOR ANALYSING FERTILITY IN EL GEBEL EL AKHDAR

The previous section has repeated specific measures of fertility relating to El Gebel El Akhdar. I turn now to provide contextual information about how fertility change in the area relates to wider fertility change across Libya. To do this it is necessary to use the only measure possible (given the data constraints of secondary material). This measure is the crude birth rate (CBR). This measure is then used to examine Woods' (1979) model of the diffusion of fertility decline.

5.3.1 The crude birth rate in Libya 1970-2006

The crude birth rate is a simple measurement which expresses the number of live births in a time period, usually a calendar year as a ratio of the number of births to population at mid-year times one thousand (Woods, 1979, 106).

$$CBR = \frac{TB}{TP} * 1000$$

Existing evidence of demographic transition indicates that the crude birth rate varies greatly within and between countries and continents. For example, consider the variation between Africa continent, which still has a high CBR of 36 per thousand while Europe recorded a CBR of only 10.5 per thousand between 2005 and 2010 (UN, 2010 http://esa.un)

These differences may be attributed to many factors, such as socio-economic forces, particularly education. Libya as an African state enjoys higher standards of living than most of the continent but nevertheless has a high CBR.

Crude birth rates in Libya have varied over time with changing political, social and economical circumstances. Table 5.10 shows that the crude birth rates were very high in the 1970s. The average was 46.3 per thousand in 1970-1975, and then decreased to 42.5 per thousand from 1976 to 1980. The drop may have been partially affected by the war between Libya and Chad. Whatever the reason it is clear that this downward fertility trend was temporary. From 1980 to 1985 the average crude birth rate rose again, reaching 47.2 per thousand. This rise may have been partially a reflection of local circumstances in Libya,

but rising fertility at the onset of the fertility transition is far from unusual with demographers observing the same phenomenon in other countries. They have attributed it to the effects of improved nutrition and other welfare improvements that enhance the fecundity of the population.

Table 5.10: Crude birth rate of Libya 1970-2005

Years	CBR (average)
1970/75	46.3
1975/80	42.5
1980/85	47.2
1985/90	46.0
1990/95	29.7
1995/00	23.8
2000/05	19.4

Sources: -MoP, Statistics Group for 1968
- MoP, Statistics Group for 1980
- NAID, Vital statistics 1990
- NAID, Statistical booklet 1998
- NAID, vital statistics 1990-1995, 1995-2000, 2000-2005.

In the Libyan case the 1970s and 1980s were an era of unusually high oil wealth. The Libyan government invested some of these resources in a diverse range of development projects as well as in basic infrastructure including local health services. In rural and urban areas education and health services spread rapidly and were made available free of charge. In terms of development projects, examples include the agricultural projects launched in El Gebel El Akhdar. In this region 9596 farm projects were established spread across the whole areas of El Gebel El Akhdar as well in the El Jafara plain project (which had 4273 farm projects). Other examples included those in El Kufra and El Sarir (Ganous et al, 1995). These development projects had many effects, but in the

context of this thesis the key thing is that they contributed to the improvement of the living standard of the population and hence may have impacted on fertility rates. These may temporarily have favoured a rise in birth rates.

By the 1990s crude birth rates were declining once again. The average crude birth rates decreased to about 19 per thousand in 2000-2005 conforming to levels similar to those in some developed countries. This decrease may be partially a result of the increasing percentage of educated people. The spread of education may have led to a corresponding spread of contraceptive knowledge as well as contributing to changes in sexual behaviour patterns. All the aforementioned factors contributed to the decline in Libya in the total fertility rate (TFR) from 8.0 in 1970 to 4.8 in 1990 and 3.3 in 2006 (MoP, 1977; NAID, 2009; Unicef, 2008), but only further research will reveal the relative importance of each of these factors.

In addition, it is possible that changing political and economic circumstances from the 1990s onwards affected fertility. For example in 1984 the Libyan government abolished the Ministry of Housing and the Ministry of Agriculture. The first move resulted in a shortage of housing, so many young people could not get a house and this may have delayed the age of marriage in a dramatic fashion. The change in housing provision was especially marked because renting a house is not allowed in Libya. Cancellation of the projects that had been launched by the Agricultural Ministry adversely affected the rural economy and plunged dependent populations into a crisis. At the same time the Libyan government took the decision to limit salaries (decision number 15, 1981),

(Secretariat of Justice, 1981) which affected living conditions. The health budget was slashed and never exceeded 2.7% of the Gross National Product (El-Hudairy, 2000). Also the impact of earlier educational investments was taking effect. The spread of mass education established a few decades earlier undoubtedly began to have an impact on fertility both directly and indirectly, as will be discussed later in the thesis.

5.3.2 Spatial variation in fertility across Libyan Regions

As a geographer, spatial variations in fertility are of particular interest. Some of these variations are shown in Table 5.11. In order to analyse these variations an average crude birth rate was calculated for the years 2002, 2003 and 2004. The average CBR was highest in Murzuk at about 27.83 per thousand. Murzuk is a desert province in southern Libya which has experienced rapid development in recent years especially in the services sector. It has experienced much in-migration of population from neighbouring regions as well as immigration from Chad, Niger and Mali. It is probable that the distinctive cultural and social characteristics of these migrant groups in part accounts for the higher fertility levels of this area.

Conversely, the lowest CBR shown in Table 5.11 is in northern Libya. Indeed, the interesting feature of the map is that almost half of all areas in the north had an average CBR of less than 20 per thousand. The highest average crude birth rates appear in the south of Libya in Murzuk and ElJoufra in the desert areas with low population densities; the lowest crude birth rates were in the

north east and west of Libya in El Gobba and El Jafara. The average of crude birth rates in El Gobba and El Jafara were 11.92 and 12.31 per thousand respectively. These average CBRs are represented graphically in Figure 5.9 in terms of the rank distributing for each province, as well as in the form of a map (Figure 5.10) which suggests a degree of spatial autocorrelation in fertility rates.

The spread of education may have hastened the decline of CBRs encouraging a delay in marriage. Increased years of schooling impact on fertility both through delaying the probability of marriage until a later age and also by increasing participation of at least a proportion of women in the labour market.

The situation in the largest cities is interesting. For example, Tripoli and Benghazi (the capital and second city of Libya) recorded average crude birth rates of 22.16 and 21.38 per thousand between 2002 and 2004. Although they are lower than other regions due to the effects of urbanisation, education, mass media, the crude birth rates were not as low as some other regions. This may be cause of in-migration. Some 43% of regions in Libya had crude birth rates of less than 20 per thousand, showing just how much higher these large cities were.

Table 5.11: Average crude birth rates (CBR) 2002 -2004

Regions	Total of population 2002	Total of population 2003	Total of population 2004	Total of Births 2002	Total of Births 2003	Total of Births 2004	average (CBR) 2002-04
Murzuk	64826	68718	70984	2273	1816	1604	27.83
El Joufra	43700	45117	46646	1166	1301	1234	27.32
Derna	79816	81174	82949	2008	2148	1991	25.20
Gadames	18622	19000	19487	488	485	441	24.76
El Batan	140636	144527	148800	3478	3459	3652	24.40
El gebel el akhadar	187692	194185	200799	3917	4847	5308	24.15
Wai El Shati	75007	77203	79544	1761	2049	1769	24.07
El Wahat	28464	29256	30225	652	818	628	23.86
Tripoli	1127118	882926	896770	24943	19249	20752	22.34
El Margheb	316371	328292	340964	7059	6792	8102	22.27
Sabrata&Surman	148612	152521	156818	3158	3146	3645	21.73
Yefren&Jadu	113931	117647	121731	2607	2341	2654	21.52
Benghazi	615463	636992	660147	12561	14036	14285	21.38
Mizda	39806	41476	43226	862	932	841	21.16
Sebha	121864	126610	131791	2406	2590	3021	21.08
Misurata	340522	360521	378523	7781	7499	6976	20.62
El Marj	113069	116318	119908	2182	2187	2717	20.29
Sharian	155933	161408	166702	3194	3144	3349	20.01
Zawia	191514	197177	203400	4069	3861	3796	19.80
Beni Walid	74670	77424	80361	1283	1401	1815	19.35
El kufra	49149	51433	53868	882	1036	1016	19.00
Tarhun&Missllata	286832	296092	306198	4349	5368	5808	17.46
Ajdabia	153061	165839	177366	2827	2563	3136	17.18
Ghat	21811	22770	23683	381	345	432	16.96
El Nikaht El khams	203044	208954	215437	3418	3276	3900	16.88
Nalut	83399	86801	92023	1128	1172	2016	16.46
Tagoura	-	-	278534	-	-	4241	15.23
El Hajam El Akhdar	105456	108859	112379	1071	1907	1730	14.41
Wadi Elhaya	69394	72587	75645	1052	943	1095	14.20
Sirt	147305	156389	166729	1778	1964	2533	13.34
ElJafara	279683	289340	299936	3149	3325	4222	12.31
El Gobba	87656	93895	101095	1203	1243	924	11.92
A average CBR OF LIBYA							20.02

Source: (Data derived from National Authority for Information and Documentation, Vital Statistic, 2002, 2003 and 2004

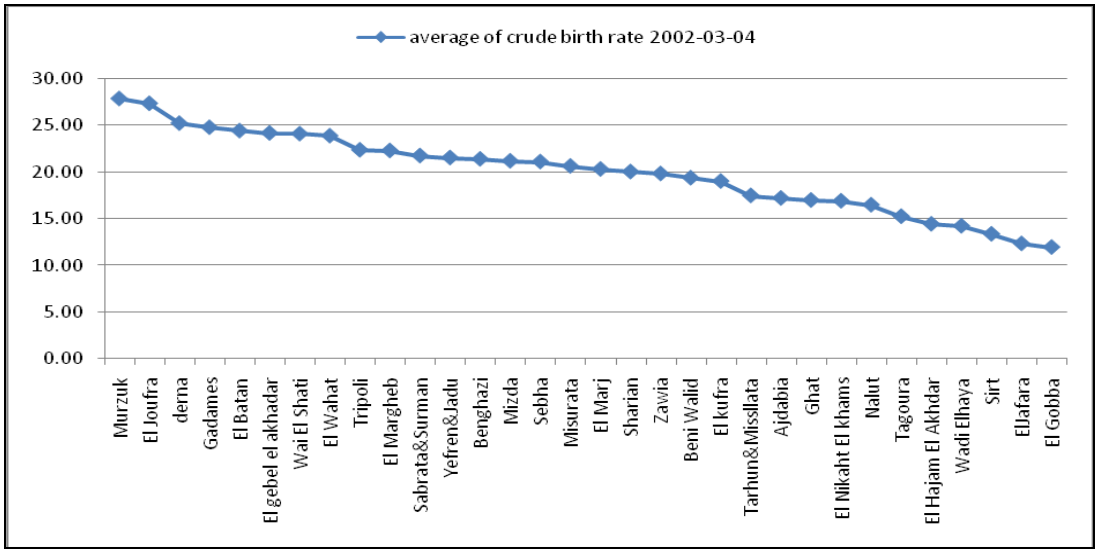


Figure 5-9 Average crude birth rate 2002-2004 by province

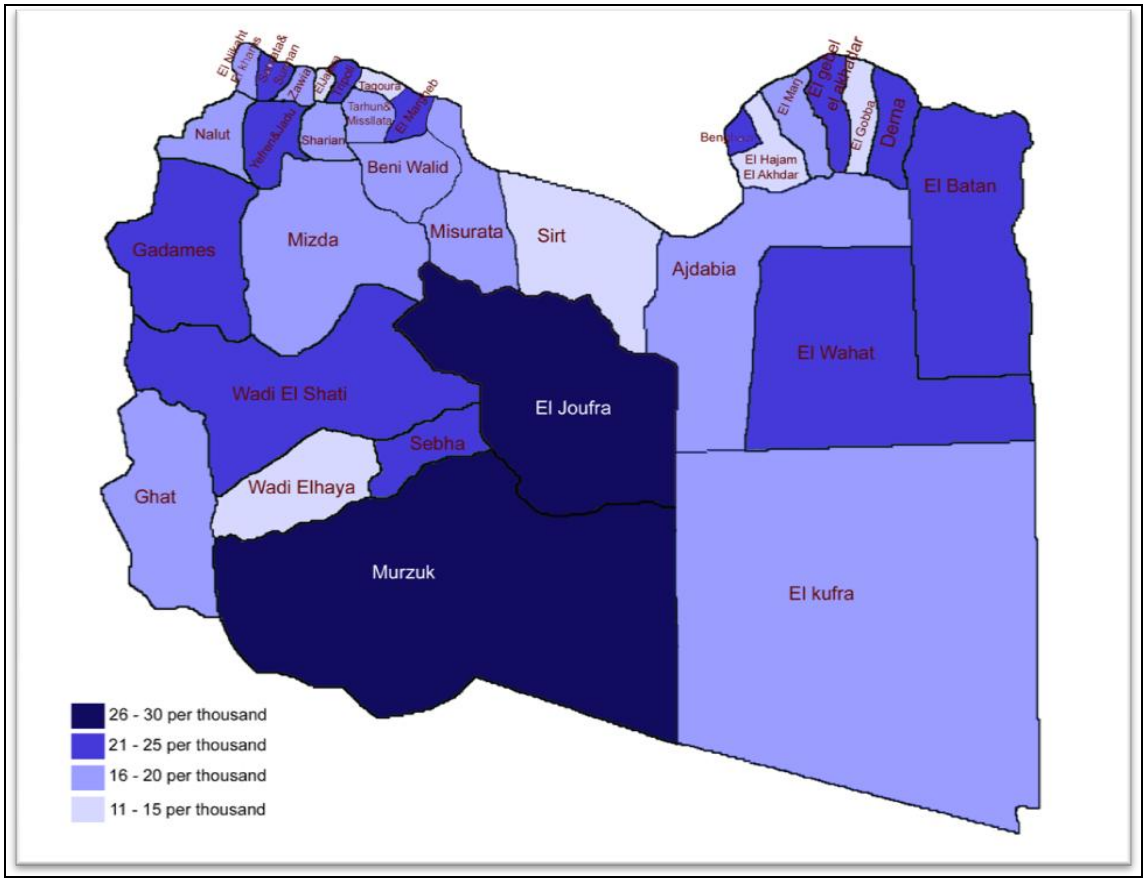


Figure 5-10 : Distribution of average crude birth rate in Libya 2002-2004

Prepared by author from (MoP), 1978, National Atlas. Tripoli

El Gebel El Akhader, the case study area of this thesis, had an average crude birth in 2002-04 levels of 24.15 per thousand. Although crude birth rates declined in the study area from 56 per thousand in 1973 to 24 in 2004, they were still high compared with other regions. One of the interests underpinning the thesis is therefore explaining why this is case, given the location of the study area in northern Libya.

Finally, Figure 5.10 shows that, there is a still clear spatial variation in fertility in Libya, even although, the crude birth rate has declined significantly from 46 to 19 per thousand during the period from 1970-2005. It is therefore worth seeking to know what stage Libya has reach in its fertility decline and why spatial variations remain so significant. The next section explores the issues compared with models of spatial fertility variation in other countries.

5.3.3 Modelling spatio-temporal fertility trends

Woods (1979) was one of the first academics to offer a statistical model of spatial variation in fertility. The model is presented in Figure 5.11 and attempts to generalize the spatio-temporal fertility trends identified by Livi-Bacci and others who have looked at the topic in Europe. Figure 5.11 plots the statistical distribution of fertility rates for a country in the form of a frequency chart. In time period one (t1), nearly all areas have a high fertility level, with Figure 5.11 suggesting that there will be a normal frequency distribution with a low level of variation about the mean level.

In time period two (t2), fertility has declined slightly in most areas. The decline has been more pronounced in leading regions, producing a frequency distribution that is now positively skewed and with an increased variance. In time period three (t3) fertility declines have been substantial in all areas, and the variance is at a maximum. In time four (t4) the frequency distribution is negatively skewed, most areas having reached a low fertility, while in time period five (t5) the frequency distribution reflects low fertility and a convergence of values as a result of most areas shifting to moderately homogeneous fertility behaviour as levels of urbanisation and industrialisation rise across the country (Woods, 1979).

This model is based on empirical evidence from Italy and France. In the Italian case the frequency distribution in 1881 was similar to (t1) and in 1911 it conformed to (t2) and 1961 with (t5). In France, 1831 appears to be more in keeping with (t3) and 1901 with (t4). Comparing the frequency distribution of crude birth rates in Libya (Table 5.12), with the Italian and French experiences reveals some interesting comparisons emerge.

The frequency distribution of the average crude birth rate in Libya 2002-04, (Figure 5.12), seems to conform to some extent to the pattern noted by Woods (1979) for time period two (t2). This is a phase where there has been a slight decline of fertility in most areas and a more rapid decline in a few leading places. It appears that most regions of Libya have witnessed a slight decline in the average crude birth rates to less than 20 per thousand by 2002-2004. This placed Libya in the same situation that Italy reached about 1911

(and maybe like the situation of France in 1841). The variance of fertility rates about the mean in Italy and France was of course shaped by social and economic factors that were very different from those operating in Libya at the end of the twentieth century, but in one respect at least change was being shaped by a common factor: education. In Libya the frequency distribution at least in part appears to have been the result of the recent spread of education which led to a delay in the average age of first marriage as suggested above. This is a matter to which the thesis returns in chapter 6.

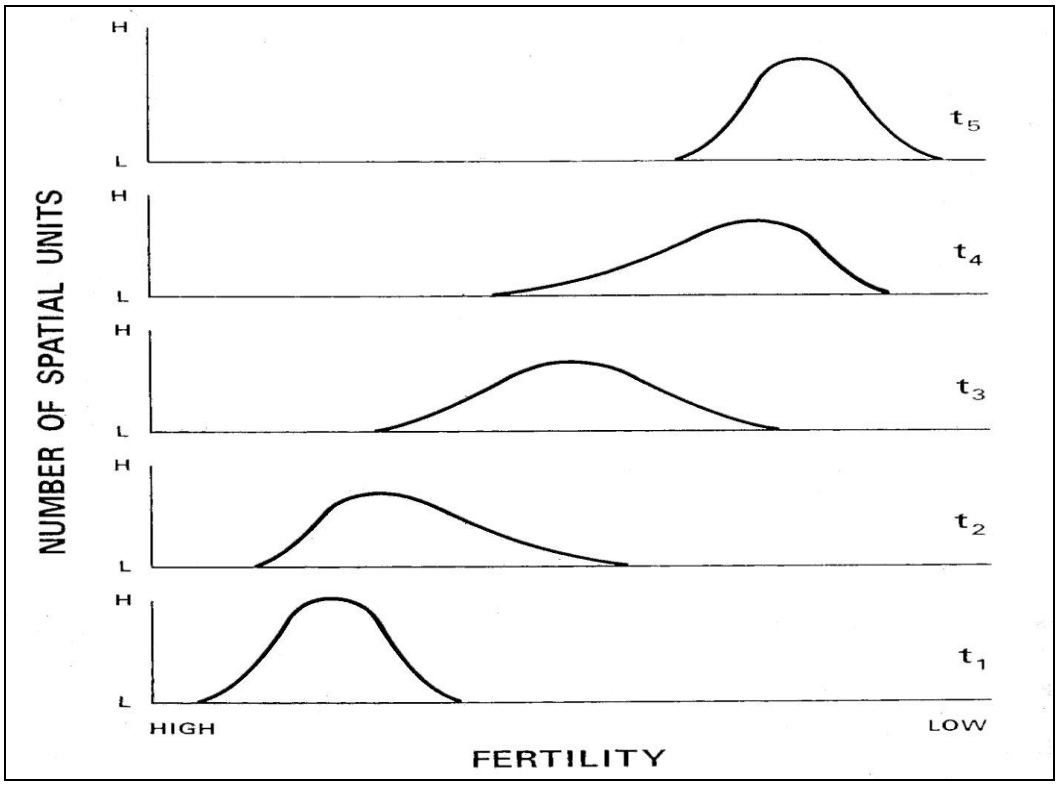


Figure 5-11: Five-stages of models of the fertility decline in a set of spatial units
Source: Woods, 1979, 142

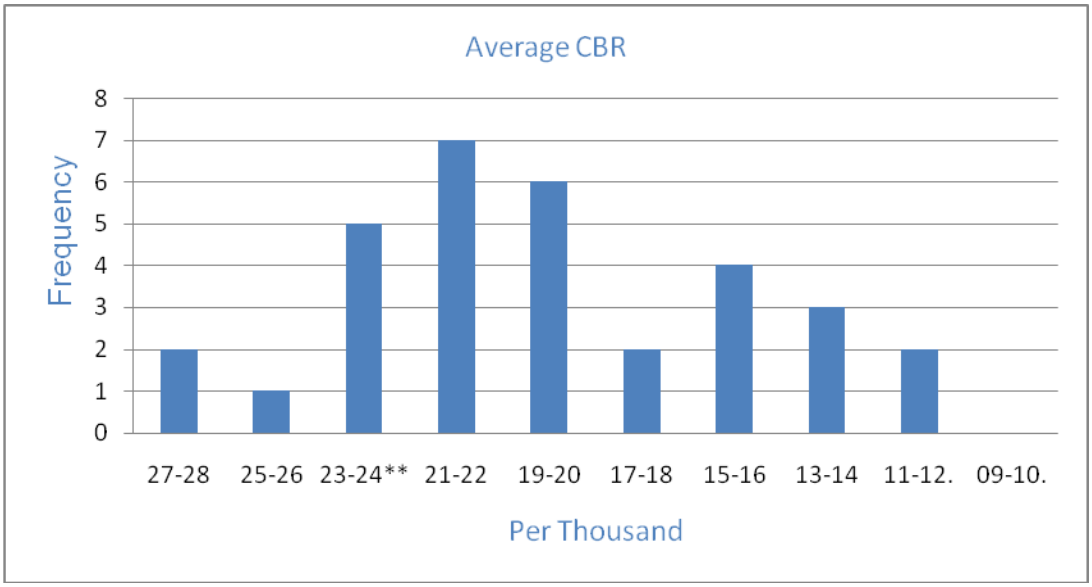


Figure 5-12: Frequency distribution of average of crude birth rate 2002-2004

Table 5.12: Frequency distribution of average crude birth rate

Crude birth rate	Frequency distribution of average of crude birth 2002-2003-2004
27-28	2
25-26	1
23-24	5
21-22	7
19-20	6
17-18	2
15-16	4
13-14	3
11-12	2
09-10	0

In conclusion, although, there has been a reduction in spatial variations in fertility in West European countries in recent decades which has led to a call among some geographers (Wilson, 1990; Graham, 2000, 2001) to rethink the utility of spatial analyses of fertility behaviour and for re-theorisation of the field, the effects of spatial variation in other societies remain important. The evidence of its significance remains in the majority of developing countries. Therefore, as surveyed in chapter 2 there is still a need in these contexts,

including in Libya, to understand the reasons for the variations. The evidence of this chapter has reinforced this view.

5.4 CONCLUSION

The analysis of fertility decline in El Gebel El Akhdar in this chapter leads to the following conclusions: It has been demonstrated that a huge decline has been experienced in fertility rates from the 1970s onwards, and that this decline coincides with the increase in the level of education.

The application of diverse methods of measuring fertility indicated that fertility has experienced a tremendous decline in El Gebel El Akhdar. The Total Fertility Rate declined from 7.5 children per woman in 1978 to 4.9 in 2008 in the study area. The General fertility rate decreased from 289 per thousand women in 1978 to 117 in 2008. Total marital fertility also declined from 10.3 per women to 5.7 in 2008. The crude birth rate declined from 56 per thousand in 1973 to 24 in 2004. The gross reproduction ratio declined from 4.4 in 1973 to 2.2 in 2008. It is obvious that fertility remained very high during the 1970s and 1980s. The onset of the transition was observed in the early of 1990s.

Place also had an effect on fertility behaviour with there being a notable variations between rural and urban women in the 1970s. GFR was 320 children per thousand women in rural areas, while it was 258 children in urban settlements. Spatial variation was observed until the early 1990s when a convergence between places began to emerge, and by 2008 fertility differences had almost disappeared.

The frequency distribution of the average crude birth rate in Libya (2002-04) seems to conform to some extent to the pattern noted by Woods (1979) for time period two (t2) of his model. This is a phase where there has been a slight decline of fertility in most areas with more rapid decline in a few leading places (northern regions of Libya which recorded fertility rates less than 20 per thousand women in 2004). This placed Libya in the same situation that Italy reached about 1911 and France in 1841. This finding raises questions: why has fertility changed? How has it changed? Why did spatial variation nearly disappear? What are the reasons underlying convergence? These questions are addressed in the following chapters.

6 CHAPTER SIX: THE EFFECT OF POST-PARTUM INFECUNDABILITY (BREASTFEEDING AND ABSTINENCE) AND CONTRACEPTION ON FEMALE FERTILITY BEHAVIOUR

6.1 INTRODUCTION

In the previous chapter, it was demonstrated that fertility levels in Libya in general, and in the study area of El Gebel El Akhdar in particular have experienced tremendous change in the last few decades. The transition has, however, happened markedly later than in most countries of the global south (Casterline, 1991& 2001; Chackiel and Schkolnik, 1996). The purpose of this chapter is to examine why this happened. The focus is on examining the factors that shape female fertility behaviour change through testing the proximate determinants of fertility as indicated by Bongaarts' model in 1982 (chapter 2).

This chapter is organized into four main sections. In the next section, marriage as one of the most important determinants of fertility is examined by measuring the change of mean age at first marriage between older and younger women. Also, proportion married and the index of marriage are explored to find out how they changed over time. The third section examines the impact of post-partum infecundability on fertility. Breastfeeding as the most significant natural contraceptive method (as explained in chapter 2) is examined among older and younger women for first and second children as well as between urban and rural women for first and second child. Also, the length of breastfeeding is

tested according to age. Then a brief indication of the effect of education on post-partum infecundability is given.

Section four explores use of contraceptive methods in the study area. Contraceptive data is based on interview and secondary evidence that shows how the spread of contraception in the study area could explain the change of female reproductive behaviour.

The last section examines the position of fertility and demographic transition in Libya and the study area in the context of the global scale by comparing the fertility transition in Libya with Reher's theory (2004).

This chapter is based on primary data collected by the author, complemented by census data for the years 1973 and 2006.

6.2 PROXIMATE DETERMINATES OF FERTILITY

Attention now turns to demographic models of change in female reproductive behaviour (Davies & Black 1956, Bongaarts, 1978, 1982, 1985 Caldwell 1982). As chapter 2 has shown, Bongaarts (1982) in particular claimed that biological factors are the principal determinants of fertility decline. In the following discussion, these determinants are tested in context of the survey data to find out the demographic (as opposed to the spatial and socio-economic) reasons for fertility change in the study area.

In chapter 2 it was shown that Davis & Blake (1956) identified 11 variables which affect fertility, but that Bongaarts' (1978 &1982) was able to focus attention on only four variables which he showed were responsible for most of the difference between fecundity and total fertility rates. Accordingly, each variable (4 intermediate variables) is now investigated in turn.

6.2.1 Marriage

6.2.1.1 Mean age at marriage

Marriage is one of the most important proximate determinants of fertility. Table 6.1 shows for the study area in El Gebel El Akhdar, that the mean age at marriage for women over 45 was as low as 18 years of age. This was true both in urban and rural areas. The custom of early marriage had clearly been very important for these older women in explaining their long reproductive lives and high fertility. The figures are not out of line with research in other parts of North Africa (Yousif, 1996).

Considerable change has occurred in the mean age at marriage among younger generations. The survey data pointed to the average age of marriage for women 45 and less as being 23 years of age. The age at first marriage will be discussed further in next chapter.

The Libyan Census conforms to the survey's findings. Female age at first marriage has increased significantly in Libya in recent years from 18 years in 1973 to 30 in 2006(MoP, 1977; NAID, 2009).

Table 6.1: The mean age of marriage among rural, urban and old, young women [in the study area]

Companied Women over 45				Companied women less than 45			
Age band	No of women	Mean age at marriage		Age band	No of women	Mean age at marriage	
10-14.	30	360		10-14.	1	12	
15-19	161	2737		15-19	70	1190	
20-24	87	1914		20-24	122	2684	
25-29	19	513		25-29	82	2214	
30-34	1	32		30-34	24	768	
35-39	2	74		35-39	1	37	
Total	300	5630	18.77	40-44	300	6905	23.02
Urban over 45				Urban less than 45			
Age band	No of women	Mean age at marriage		Age band	No of women	Mean age at marriage	
10-14.	15	180		10-14.	0	0	
15-19	78	1326		15-19	26	442	
20-24	46	1012		20-24	65	1430	
25-29	10	270		25-29	48	1296	
30-34	1	32		30-34	11	352	
35-39	0	0		35-39	0	0	
Total	150	2820	18.80	40-44	150	3520	23.47
Rural Over 45				Rural less than 45			
Age band	No of women	Mean age at marriage		Age band	No of women	Mean age at marriage	
10-14.	15	180		10-14.	1	12	
15-19	83	1411		15-19	44	748	
20-24	41	902		20-24	57	1254	
25-29	9	243		25-29	34	918	
30-34	0	0		30-34	13	416	
35-39	2	74		35-39	1	37	
Total	150	2810	18.75	40-44	150	3385	23.00

Source: Calculation done by researcher

6.2.1.2 Proportion married

The proportion of married women is also a valuable indicator of the percentage of women at risk of pregnancy in the productive cohorts (15-49). "In most societies women spend substantial proportions of their potential reproductive years out of marriage; either before first marriage or after a marriage has ended due to divorce, separation, or death of husband as well as some women never marry" (Bongaarts, 1978, 108). Therefore, the proportion of marriage is important measuring of fertility.

Only married women are investigated in this section for the reasons noted in the methodology chapter. Inevitably some, who were married say in the 1970s, had become widows by the time of the survey. Inversely some younger women at the time of the author's survey were too young to have been married in the 1970s or 1980s. Table 6.2 provides information therefore for women included in the researcher's survey in 2008 and reports the proportions who were married in 1971 and every decade thereafter. Thus, for example, of the 300 women included in the survey in 2008 who were over 45 years of age most were too young to be married in 1971. Only 93 of the 300 women (31%) were married in 1971. The number of rural women who were married (and married young) was higher than for urban residents in the survey.

By the 1980s a much higher proportion of the women in the older sample of women (over 45 in 2008) were married 236 of 300 in 1981 (79%); by 1991 this proportion was still higher (86%). In 2001 the number and proportion of married women was 258 out of 300 and the proportion was 86%. As well as this, the proportion of rural women was higher than urban women (90.6% to 81.3% respectively). The increase in the married women proportion was attributed to the change of age structure.

It is interesting to compare the proportion of women in a given cohort who were married at any point in time. Here we consider only the proportion of married women amongst those aged 15-49 (excluding those who left this cohort).

Table 6.2: Proportion married in El Gebel El Akhdar

Combined 1971	Age band	5-9.	10-14.	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	Total
	Women	68	94	60	41	25	8	4	0	0	0	0	0	0	300
	Married	0	0	33	27	23	6	4	0	0	0	0	0	0	93
	Percent	0	0	55.00	65.85	92.00	75.00	100.00	0	0	0	0	0	0	31.00
Urban 1971	Women	32	46	34	22	11	4	1	0	0	0	0	0	0	150
	Married	0	0	16	14	10	3	1	0	0	0	0	0	0	44
	Percent	0	0	47.06	63.64	90.91	75.00	100.00	0	0	0	0	0	0	29.33
Rural 1971	women	36	48	26	19	14	4	3	0	0	0	0	0	0	150
	married	0	0	17	13	13	3	3	0	0	0	0	0	0	49
	Percent	0	0	65.4	68.4	92.9	75.0	100.0	0	0	0	0	0	0	32.7
Combined 1981	Women	0	0	68	94	60	41	25	8	4	0	0	0	0	300
	Married	0	0	28	71	52	35	20	5	2	0	0	0	0	236
	Percent	0	0	41.18	75.53	86.67	85.37	80.00	62.50	50.00	0	0	0	0	78.67
Urban 1981	Women	0	0	32	46	34	22	11	4	1	0	0	0	0	150
	Married	0	0	12	35	30	17	8	2	1	0	0	0	0	118
	Percent	0	0	37.50	76.09	88.24	77.27	72.73	50.00	100.00	0	0	0	0	78.67
Rural 1981	women	0	0	36	48	26	19	14	4	3	0	0	0	0	150
	married	0	0	16	36	22	18	12	3	1	0	0	0	0	118
	Percent	0	0	44.44	75.00	84.62	94.74	85.71	75.00	33.33	0	0	0	0	78.67
Combined 1991	Women	0	0	0	0	68	94	60	41	25	8	4	.0	0	300
	Married	0	0	0	0	66	86	54	31	17	4	0	.0	0	258
	Percent	0	0	0	0	97.06	91.49	90.00	75.61	68.00	50.00	0.00	0.00	0	86.00
Urban 1991	Women	0	0	0	0	32	46	34	22	11	4	1	.0	0	150
	Married	0	0	0	0	31	42	30	16	9	2	.0	.0	0	130
	Percent	0	0	0	0	96.88	91.30	88.24	72.73	81.82	50.00	0.00		0	86.67
Rural 1991	women	0	0	0	0	36	48	26	19	14	4	3	.0	0	150
	married	0	0	0	0	35	44	24	15	8	2	0	.0	0	128
	Percent	0	0	0	0	97.22	91.67	92.31	78.95	57.14	50.00	0.00	.0	0	85.33
Combined 2001	Women	0	0	0	0	0	0	68	94	60	41	25	8	4	300
	Married	0	0	0	0	0	0	64	83	56	30	17	6	2	258
	Percent	0	0	0	0	0	0	94.12	88.30	93.33	73.17	68.00	75.00	50.00	86.00
Urban 2001	Women	0	0	0	0	0	0	32	46	34	22	11	4	1	150
	Married	0	0	0	0	0	0	29	40	30	13	7	2	1	122
	Percent	0	0	0	0	0	0	90.63	86.96	88.24	59.09	63.64	50.00	100.00	81.33
Rural 2001	women	0	0	0	0	0	0	36	48	26	19	14	4	3	150
	married	0	0	0	0	0	0	35	43	26	17	10	4	1	136
	Percent	0	0	0	0	0	0	97.22	89.58	100.00	89.47	71.43	100.00	33.33	90.67

Source: Calculation done by researcher

6.2.1.3 The index of marriage

Bongaarts (1982) illustrated in his model the fertility inhibiting effects of marriage as one of his four significant intermediate variables (See once again Figure 2.1). He measured the effect by "an index of marriage (Cm) - [{1}, {0}]; that is, {1} if all women of reproductive age are married and {0} in the absence of marriage" (Bongaarts, 1982, 155).

The index of marriage is obtained by dividing the total fertility rate (births that occur within marriage) by the total marital fertility rate ($Cm = \frac{TFR}{TM}$)

It should be kept in mind that only married, widowed and divorced women were involved in the survey. Table 6.3 shows that many young women in the 2008 survey of reproductive age were not married in 2001. The index of marriage is 0.5. It is clear that not only were some too young to be married, but that many of marriageable age had not yet married.

Table 6.3 : Index of marriage in 2001

TFR Urban Women -45 years old					TM Urban Women -45 years old				
Age band	Women	Births	ASFR	TFR	Age band	Married women	Births	MASFR	TM
10-14	8	0	0.00		10-14	0	0	0.00	
15-19	18	1	55.56		15-19	3	1	333.33	
20-24	40	4	100.00		20-24	12	4	333.33	
25-29	36	5	138.89		25-29	23	5	217.39	
30-34	37	7	189.19		30-34	34	7	205.88	
35-39	11	2	181.82		35-39	10	2	200	
Total	150	19	665.45	3.3	Total	82	19	1289.94	6.4
TFR/Rural 2001					TM/Rural 2001				
Age band	Women	Births	ASFRT	TFR	Age band	Married women	Births	MASFR	TM
10-14	7	0	0.00		10-14	0	0	0	
15-19	26	1	38.46		15-19	3	1	333.33	
20-24	22	2	90.91		20-24	7	2	285.71	
25-29	40	11	275.00		25-29	27	11	407.41	
30-34	42	7	166.67		30-34	34	7	205.88	
35-39	13	1	76.92		35-39	12	1	83.33	
Total	150	22	647.96	3.2	Total	83	22	1315.67	6.6
Combined 2001					Combined 2001				
Age band	Women	Births	ASFR	TFR	Age band	Women	Births	ASMFR	TM
10-14	15	0	0.00		10-14	0	0	0	
15-19	44	2	45.45		15-19	6	2	333.33	
20-24	62	6	96.77		20-24	19	6	315.79	
25-29	76	16	210.53		25-29	50	16	320	
30-34	79	14	177.22		30-34	68	14	205.88	
35-39	24	3	125.00		35-39	22	3	136.36	
Total	300	41	654.97	3.3	Total	165	41	1311.37	6.6
			Cm=TFR/TM CM=3.3/6.6=0.5						

Source: Calculation done by researcher

In 2006 there is a different picture. Table 6.4 indicates the majority of women of reproductive age were married, where the number of married women was 275 married women of 300 women (92%) and this is attributed to the sample being targeted to concentrate on married women. Therefore, the index of marriage was 0.8.

Table 6.4: Index of marriage in 2006

TFR/Urban -45 in 2006					TM/Urban-45 in 2006				
Age band	Women	Births	ASFR	TER	Age band	Women	Births	ASMFR	TM
15-19	8	1	125.00		15-19	5	1	200.00	
20-24	18	4	222.22		20-24	13	4	307.69	
25-29	40	11	275.00		25-29	34	11	323.53	
30-34	36	7	194.44		30-34	36	7	194.44	
35-39	37	3	81.08		35-39	37	3	81.08	
40-44	11	1	90.91		40-44	11	1	90.91	
Total	150	27	988.7	4.9	Total	136	27	1197.66	5.9
TFR/Rural -45 2006					TM/Rural2006				
Age band	Women	Births	ASFR	TER	Age band	Women	Births		
15-19	7	0	0.00		15-19	4	0	0.00	
20-24	26	5	192.31		20-24	20	5	250.00	
25-29	22	7	318.18		25-29	21	7	333.33	
30-34	40	10	250.00		30-34	39	10	256.41	
35-39	42	7	166.67		35-39	42	7	166.67	
40-44	13	1	76.92		40-44	13	1	76.92	
Total	150	30	1004.08	5.0	Total	139	30	1083.33	5.4
Combined 2006					Combined 2006				
Age band	Women	Births	ASFR	TER	Age band	Women	Births	ASMFR	TMFR
15-19	15	1	66.67		15-19	9	1	111.11	
20-24	44	9	204.55		20-24	33	9	272.73	
25-29	62	18	290.32		25-29	55	18	327.27	
30-34	76	17	223.68		30-34	75	17	226.67	
35-39	79	10	126.58		35-39	79	10	126.58	
40-44	24	2	83.33		40-44	24	2	83.33	
Total	300	57	995.13	4.9	Total	275	57	1147.69	5.7
					Cm=TFR/TM CM=4.9/5.7=0.8				

Source: Calculation done by researcher

In conclusion, many women who were under 45 in 2001 were not married, either because they were younger or they would marry later when they finished higher education and got jobs, whereas in 2006 the majority of women were married. It is interesting that although the figures for the proportion and index of marriage seem to increase due to the effect of including only married women, the total fertility and marital fertility significantly declined. That seems to indicate that the increase in education among females contributed to

a change in their behaviour and a change in their attitudes towards controlling fertility and family planning by delaying the age of first marriage and by using methods of contraception which will be examined in the following discussion.

6.2.2 Post partum infecundability

The natural contraceptive effect of breastfeeding has been of historic importance as a primary mechanism for child spacing (Gross, 2002). In recent years, the importance of breastfeeding as a natural regulator of human fertility has gained more acceptance. Indeed some have argued that lactation amenorrhoea is an appropriate method to control fertility and have stated that it should be included in natural family planning programs, especially in developing countries (Ommaselli et al, 2000).

"During lactation, menses before 6 months are mostly anovulatory, and fertility remains low. This method of fertility reduction is based on three conditions, (1) the baby is under 6 months; (2) the mother is still affected by amenorrhea; and (3) she practises exclusive or quasi-exclusive breastfeeding on demand day and night"(Vekemans,1997, 105).

The effect of breastfeeding according to Bongaarts and Potter 1983 is:

"The suckling by the infant stimulates receptors in the breast nipple that initiate a neural signal to the hypothalamus, a nerve centre in the brain. In response, the hypothalamus signals the pituitary gland to increase the production of the hormone prolactin. Prolactin, in turn, inhibits ovulation, either by reducing the

release of gonadotropic hormones needed for ovulation or by directly affecting the ovaries. This physiological process identifies frequent nipple stimulation as the critical factor in maintaining an ovulation" (Bongaarts and Potter, 1983, 27)

Accordingly, Bongaarts indicated in his theory that the practice of lactation and post- partum absence accounts for the difference between total natural marital fertility and the total fecundity rate. The practice of lactation was an important method of fertility limitation in traditional societies where post-partum abstinence was practised to increase spacing between births with the effect of reducing the TFR.

The present study allows an evaluation of the role of breastfeeding as a natural form of contraception in El Gebel El Akhdar. The researcher's survey examined breastfeeding patterns, return of fertility and pregnancy during breastfeeding for two generations - women of 45 and under and women over 45. This comparison helps to some extent to understand the variance in fertility between older and younger generations. Also, it describes the variance between urban and rural areas. In addition it examines the effect of education on women's breastfeeding behaviour.

6.2.2.1 Breastfeeding among old and young women for the first child

Table 6.5 and Table 6.6 indicate differences between old and young women. It can be seen that more of the older women practised it (Fig 6.1).

An interesting picture emerges in the figures for the length of breastfeeding for women who breastfed for 12 months or more, the figure is higher among the older women who had not attended school. 53 per cent of these women breastfed for 22-24 months; while the older more educated women breastfed for 0-9 months.

The lowest length of breastfeeding (ranging between 0-7 months) was among young women, especially women who had attained high levels of education Given that we have already seen that fertility rates were lower for younger women, it can be inferred that they looked to other forms of contraception and did not depend on breastfeeding to avoid fertility or to increase child spacing. Table 6.5 seems to point to a particularly strong inverse relation between breastfeeding of the first child and education of the mother. This effect is evident both for younger and older women although the relationship differs to some extent between the two cohorts (Tables 6.5 and 6.6).

Table 6.5: The number of breastfeeding months for 1st child for women 45+

Level of Education	Number of months of breastfeeding								
	1-3	4-6	7-9	10-12	13-15	16-18	19-21	22-24	Total
None (no schooling	1	2	4	70	5	6	17	54	159
Primary school	0	4	2	17	3	2	3	5	36
Elementary school	5	7	2	5	2	1	2	1	25
Intermediate Institute	7	9	13	3	1	0	0	2	35
Secondary school	0	0	2	1	0	0	0	0	3
University	2	6	6	1	0	0	0	0	15
Total	15	28	29	97	11	9	22	62	273

Source: Calculation done by researcher

Table 6.6: The number of breastfeeding months for 1st child for women 45-

Level of Education	Number of months of breastfeeding							
	1-3	4-6	7-9	10-12	13-15	16-18	19-21	Total
None (no schooling	1	2	3	2	0	1	2	11
Primary school	3	7	8	3	2	2	2	27
Elementary school	6	17	12	4	0	0	2	41
Intermediate Institute	9	17	20	1	0	1	0	48
Secondary school	3	6	10	3	0	1	0	23
University	19	35	20	7	0	2	1	84
Total	41	84	73	20	2	7	7	234

Source: Calculation done by researcher

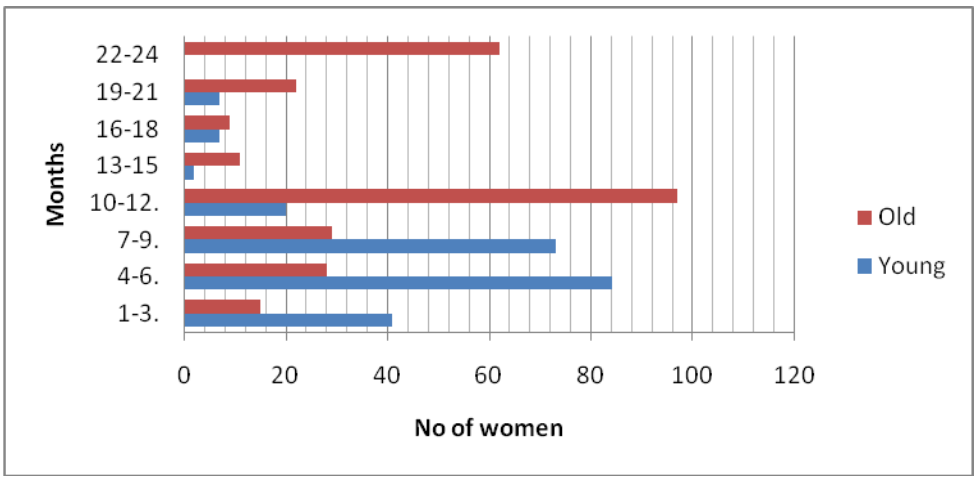


Figure 6-1: The length of breastfeeding

Table 6.7 measures the strength of the negative relationship between the level of education and the length of breastfeeding for women of 45 and less years of age, using Pearson correlation coefficients. The relationship is analysed for first and second child. The coefficients are -0.241** and -0.356** respectively, both significant at p=0.01. It is interesting that the relationship is stronger for the second child.

Table 6.7: Correlation between the level of education and number of months of breastfeeding for first and second child for women under 45-

Correlations

		Education level for urban.rural women -45	Number of months for first child -45	Number of months for second child -45
Education level for urban. rural women -45	Pearson Correlation	1	-.241**	-.356**
	Sig. (2-tailed)		.000	.000
	N	300	234	182
Number of months for first child -45	Pearson Correlation	-.241**	1	.601**
	Sig. (2-tailed)	.000		.000
	N	234	234	181
Number of months for second child -45	Pearson Correlation	-.356**	.601**	1
	Sig. (2-tailed)	.000	.000	
	N	182	181	182

**. Correlation is significant at the 0.01 level (2-tailed).

6.2.2.2 Breastfeeding among old and young women for the second child

The practise of breastfeeding for older and younger women was also analysed for their second child (Tables 6.8 and 6.9). The pattern is similar to that for the first child. More than 60% of uneducated women have breastfed for 12-24 months.

Table 6.8: The number of breastfeeding months for second child for rural & urban women 45+

Level of Education	Number of months of breastfeeding								
	1-3	4-6	7-9	10-12	13-15	16-18	19-21	22-24	Total
None (no schooling	0	2	2	55	7	11	23	52	152
read and write	0	0	0	2	1	0	3	2	8
Primary school	0	2	1	18	3	3	3	6	36
Elementary school	4	4	3	7	2	3	1	1	25
Intermediate Institute	3	9	13	5	2	0	2	0	34
Secondary school	0	0	0	1	1	0	1	0	3
University	2	6	3	4	0	0	0	0	15
Total	9	23	22	92	16	17	33	61	273

Source: Calculation done by researcher

Table 6.9: The number of breastfeeding months for second child for urban & rural women 45-

Level of Education	Number of months of breastfeeding							
	0-3	4-6	7-9	10-12	13-15	16-18	19-21	Total
None (no schooling	0	3	2	0	2	2	2	11
Primary school	5	6	3	5	1	3	2	25
Elementary school	4	10	10	5	2	0	1	32
Intermediate Institute	7	17	9	5	2	0	1	41
Secondary school	1	4	9	2	0	0	0	16
University	8	29	16	3	1	0	0	57
Total	25	69	49	20	8	5	6	182

Source: calculation done by researcher

Table 6.10 indicates the strength of the negative relationship between level of education and the length of breastfeeding for women over 45 years of age, again using Pearson correlation coefficients. The relationship is analysed for first and second child. The coefficients are -0.565** and -0.559** respectively, both significant at p=0.01. It is interesting that the relationship is stronger for the first child. Otherwise, the increase of education among women leads to the decline of the breastfeeding period.

Table 6.10: Correlation between education and breastfeeding for older women

Correlations

		Education level for urban rural women +45	Number of months for first child +45	Number of months for secondt child +45
Education level for urban rural women +45	Pearson Correlation	1	-.565**	-.559**
	Sig. (2-tailed)		.000	.000
	N	300	273	273
Number of months for first child +45	Pearson Correlation	-.565**	1	.598**
	Sig. (2-tailed)	.000		.000
	N	273	273	271
Number of months for secondt child +45	Pearson Correlation	-.559**	.598**	1
	Sig. (2-tailed)	.000	.000	
	N	273	271	273

**. Correlation is significant at the 0.01 level (2-tailed).

In conclusion, this section has shown that breastfeeding was more widespread amongst women in the older generation during their fertile years than is true today for the younger generation. Moreover, a correlation has been shown to exist between the level of education and breastfeeding. The length of lactation was greater among uneducated women while the majority of educated women practised feeding for only 0-9 months. This means for the latter group that other methods of contraception must be being used to achieve birth spacing. Another important correlate of post partum infecundability is the place of residence as discussed below.

6.2.2.3 Post partum infecundability among urban & rural women for the first child

The patterns of post partum abstinence were investigated in rural and urban areas in order to identify if the durations were longer for rural than urban residents. Consequently, post partum infecundability could be rejected or accepted as a differential determinant of fertility or birth spacing in different environments.

Tables 6.11 and 6.12 reveal that although breastfeeding for the first child was a little higher among rural women, there is no significant difference between rural and urban women. The period of breastfeeding was higher among uneducated women in both regions and there was no significant difference between educated women in rural and urban areas.

To conclude the above discussion, it can be said although there was a similar trend in the period of breast feeding according to the level of education in both areas, the breastfeeding among rural women was a little higher than urban women, particularly among uneducated women.

Table 6.11: The number of breastfeeding months for first child for urban women

Level of Education	Number of months of breastfeeding								
	1-3	4-6	7-9	10-12	13-15	16-18	19-21	22-24	Total
None (no schooling	0	1	2	31	1	0	8	23	66
read and write	0	0	0	2	0	1	0	1	4
Primary school	3	4	4	12	1	2	5	2	33
Elementary school	7	10	5	2	1	1	4	0	30
Intermediate Institute	10	15	17	1	1	1	0	0	45
Secondary school	2	2	6	2	0	1	0	0	13
University	10	22	15	6	0	2	1	0	56
Total	32	54	49	56	4	8	18	26	247

Source: Calculation done by researcher

Table 6.12: The number of breastfeeding months for first child for rural women

Level of Education	Number of months of breastfeeding								
	1-3	4-6	7-9	10-12	13-15	16-18	19-21	22-24	Total
None (no schooling	2	3	4	36	4	6	10	33	98
read and write	0	0	1	0	0	1	4	0	6
Primary school	0	7	6	5	4	2	0	3	27
Elementary school	4	14	9	7	1	0	0	1	36
Intermediate Institute	6	10	13	3	0	0	0	2	34
Secondary school	1	4	6	2	0	0	0	0	13
University	11	19	11	2	0	0	0	0	43
Total	24	57	50	55	9	9	14	39	257

Source: Calculation done by researcher

Table 6.13 measures the strength of the negative relationship between the level of education and the length of breastfeeding for urban and rural women, using Pearson correlation coefficients. The relationship is analysed for first and second child. The coefficients are -0.607** and -0.641** respectively, both significant at p=0.01. It is interesting that the relationship is stronger for rural women.

The relationship between education and breastfeeding seem to be significantly negative in both areas (Tables 6.13 & 6.14) with higher in the rural area for the first child than urban women (-0.641** to -0.607**) and with a small difference for the feeding of the second child. Otherwise there is significant negative relationship in both areas and statistically it is extremely highly unlikely that the relationship came about by chance; this means the increase in education contributes to the reduction in breastfeeding.

Table 6.13: Correlation of the level of education and breastfeeding for urban women

Correlations

		LevedcUr	U.FiCh1	U.ScCh2
LevedcUr	Pearson Correlation	1	-.607**	-.652**
	Sig. (2-tailed)		.000	.000
	N	300	257	223
U.FiCh1	Pearson Correlation	-.607**	1	.655**
	Sig. (2-tailed)	.000		.000
	N	257	257	222
U.ScCh2	Pearson Correlation	-.652**	.655**	1
	Sig. (2-tailed)	.000	.000	
	N	223	222	223

**. Correlation is significant at the 0.01 level (2-tailed).

Table 6.14: Correlation of the level of education and breastfeeding for rural women

Correlations

		LevedcRul	R.FiCh1	RL.ScCh2
LevedcRul	Pearson Correlation	1	-.641**	-.647**
	Sig. (2-tailed)		.000	.000
	N	300	250	232
R.FiCh1	Pearson Correlation	-.641**	1	.757**
	Sig. (2-tailed)	.000		.000
	N	250	250	230
RL.ScCh2	Pearson Correlation	-.647**	.757**	1
	Sig. (2-tailed)	.000	.000	
	N	232	230	232

**. Correlation is significant at the 0.01 level (2-tailed).

6.2.2.4 Post partum infecundability among urban & rural women for the second child

The breastfeeding of the second child for urban and rural women (Tables 6.15 & 6.16) shows that although the number of lactating women declined in both areas, the figure for rural lactating women was higher than urban women (232 to 216 respectively). The period of breastfeeding appears high among uneducated women who tend to suckle for more than 12 months in both areas with a higher number among rural women. A high number of educated women tend to suckle for 4-6 months.

Table 6.15: The number of breastfeeding months for second child for urban women

Level of Education	Number of months of breastfeeding								
	1-3	4-6	7-9	10-12	13-15	16-18	19-21	22-24	Total
None (no schooling)	0	1	0	27	4	3	8	20	63
read and write	0	0	0	1	0	1	1	1	4
Primary school	2	3	1	14	2	4	5	2	33
Elementary school	6	5	3	6	2	2	2	0	26
Intermediate Institute	7	15	12	5	2	0	2	0	43
Secondary school	1	2	4	2	1	0	0	0	10
University & College	5	15	13	4	0	0	0	0	37
Total	21	41	33	59	11	10	18	23	216

Source: calculation done by researcher

Table 6.16: The number of breastfeeding months for second child for rural women

Level of Education	Number of months of breastfeeding								
	1-3	4-6	7-9	10-12	13-15	16-18	19-21	22-24	Total
None (no schooling	0	4	3	26	5	7	14	32	91
read and write	0	0	1	1	1	0	2	1	6
Primary school	3	5	3	9	2	2	0	4	28
Elementary school	2	9	10	6	2	1	0	1	31
Intermediate Institute	3	11	10	5	2	0	1	0	32
Secondary school	0	2	5	1	0	0	1	0	9
University	5	20	6	3	1	0	0	0	35
Total	13	51	38	51	13	10	18	38	232

Source: calculation done by researcher

6.2.2.5 The length of breastfeeding according to age

Post partum infecundability appears to be stronger for younger mothers. By definition of course these are likely to be women with less education. (Tables 6.17 & 6.18) show that the majority of lactating women were in the age groups 15-24 in both urban and rural areas. Women who married early (15-19) also practised breastfeeding for longer (12-24 months). The majority of lactating women in the 20-29 age group breastfed for only 0-12 months.

These primary research findings are compatible with those of the Ministry of Health and Social Security (MHSS) who conducted a survey on the maternal and child health in Libya in 2005; El Gebel El Akhdar was included in the survey. Breastfeeding was observed for 90% of babies under 3 months. The mean duration of breastfeeding was 11 months. The survey revealed that the frequency of breastfeeding per day was 3-4 times for new born babies in 44% of cases and 5-6 times a day in 35% (MHSS, 2005). Most women (94%) knew that breastfeeding was a means of family planning. Some 96% of pregnant women wanted to breastfeed their new babies (MHSS, 2005, 135).

Table 6.17: Breastfeeding for 1st child for urban according to age group

	Number of months of breastfeeding								
Age band	1-3	4-6	7-9	10-12	13-15	16-18	19-21	22-24	Total
15-19	11	7	6	30	1	1	6	15	77
20-24	11	23	20	16	3	2	9	8	92
25-29	9	17	15	6	0	2	2	3	54
30-34	1	7	7	3	0	3	1	0	22
35-39	0	0	1	1	0	0	0	0	2
Total	32	54	49	56	4	8	18	26	247

Source: Calculated by the author according to survey data

Table 6.18: Breastfeeding for 1st child for rural according to age group

	Number of months of breastfeeding								
Age band	1-3	4-6	7-9	10-12	13-15	16-18	19-21	22-24	Total
15-19	3	11	13	23	6	6	7	24	93
20-24	10	23	19	27	2	2	3	9	95
25-29	11	16	12	3	1	1	4	5	53
30-34	0	6	4	2	0	0	0	0	12
35-39	0	1	2	0	0	0	0	1	4
Total	24	57	50	55	9	9	14	39	257

Source: Calculated by the author according to survey data

In conclusion, post partum infecundability was observed in terms of widespread breastfeeding in El Gebel El Akhdar, particularly among older uneducated women in rural and urban areas, with the figures higher in the rural areas. Also, the difference in length of breastfeeding is not only observed between rural and urban areas but it is also seen among older and younger women where older women were characterized by a high rate of illiteracy and length of breastfeeding 12-24 months for first and second child. On the other hand, women under 45 noted with a high rate of education had shorter feeding times of 0-6 months.

6.2.2.6 The effect of education on breastfeeding

It is clear that education has played a great role in the breastfeeding process. Uneducated women are characterised by breastfeeding for 12 months or longer. Educated women tend to feed for six or seven months. Also, as set out in the above discussion, breastfeeding was a traditional method of spacing between births. On the other hand educated women use other modern methods of controlling fertility.

Therefore, some explanation of female education levels is useful to understand the effect of education on post partum infecundability as explained in the previous section. Comparison is made here between younger females (45 and less) with high levels of education and short breastfeeding periods and older women (over 45 years old) with a high rate of illiteracy and longer time of breastfeeding (Table 6.19 & Fig. 6.2).

Table 6.19: Level of education for all women in El Gebel El Akhdar

Level of education	Number		Percent	
	Young women	Old women	Young	Old
None (no schooling	14	168	4.7	56.0
Primary school	33	40	11.0	13.3
Elementary school	57	28	19.0	9.3
Intermediate Institute	66	43	22.0	14.3
Secondary school	28	6	9.3	2.0
University and College	102	15	34.0	5.0
Total	300	300	100.0	100.0

Source: calculation done by researcher

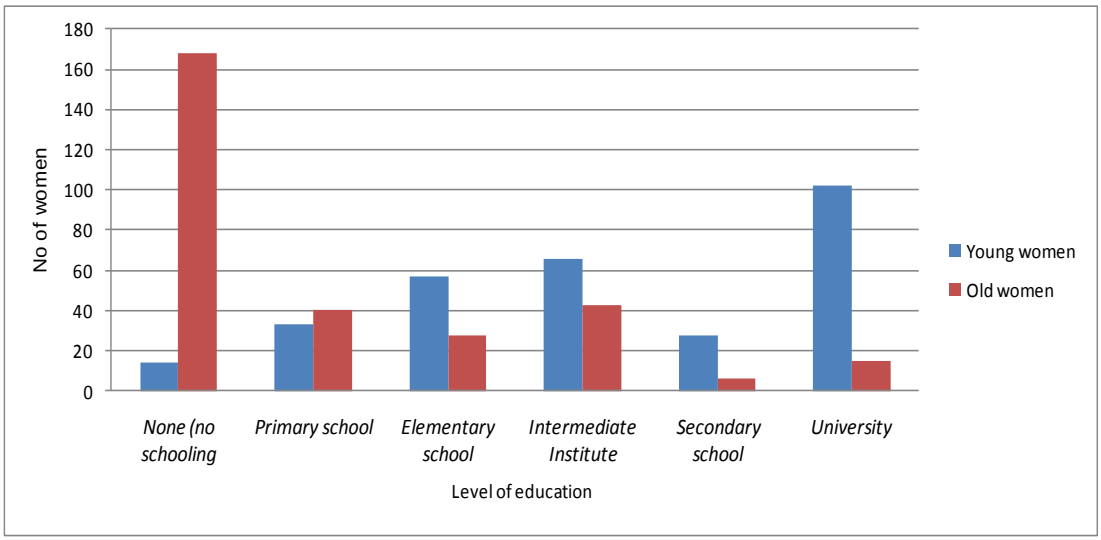


Figure 6-2: Level of education for all women

In the study, there are a high percentage of women aged over 45 with no schooling. About 56% were illiterate. On the other hand the model category in Figure 6.2 for women aged less than 45 years old is for those with university education (about 34%). About 95% of the younger women attained schooling at a primary level or above. On the other hand, more than half of all women over 45 had never attended school or had no education. Therefore, education is the most important correlates with breastfeeding; otherwise lactation is inversely related to a mother's education, and it is directly related to abstinence (Isenalumhe, 1986).

6.3 CONTRACEPTION

Contraception contributed greatly to the great revolution of the demographic transition. Bongaarts indicated in his theory that contraception had a major effect on fertility inhibition. However it was not an easy topic to research in El Gebel El Akhdar. In the following discussion, I will use statistical data and also make comments based on some interviews conducted with professional health workers.

Amina who is a doctor in the department of Obstetrics at El Thora hospital in El Bayda noted the main methods of birth control that she has observed amongst patients.

"One of the most important methods was the Pill where more than 70% of women attending the clinics (frequented women) used it to space out births.

The reason is that the Pill is cheap, it is available in Pharmacies and there is no serious impact on the health of the mother" (Personal Interview, 2008).

MHSS 2005 have done a little work on the type of contraceptive methods used in Libya: about 52% of married women used a modern method: about 39% used the Pill, about 22% the condom. The rate of using contraception appears to have increased among urban women as well as among educated women in El Gebel El Akhdar (MHSS, 2005). Amina mentioned another method of contraception when she said: "There is a natural method of controlling pregnancy by using a table of sex practice organization. Some women use this to identify the time of the month when there should be no intercourse. They look for the ten days in the middle of the egg production, but for some women there can be difficulty in using the table" (Personal Interview, 2008).

Therefore this method may be used by more educated woman who best understands how to calculate the timing of abstinence. It seems probable that the use of contraceptive methods has increased significantly in recent decades by 1995 in Libya 45% of women were using contraception (UN, 2010), but unfortunately the author had no access to detailed information about this in his study region.

6.4 FERTILITY TRANSITION IN LIBYA COMPARED WITH REHER'S THEORY

Although it is difficult to identify precisely the year of onset of fertility decline in El Gebel El Akhdar, there is little doubt that there has been a major fall since the early 1990s. The question therefore arises as to how this observation, supported as it is by the statistical material provided in this chapter, relates to wider theories of fertility transition.

According to Reher (2004), there have been huge differences around the globe in the timing of fertility decline. His analysis of secondary data points to the suggestion that the transition stretched from the late nineteenth century to the present day (Fig 6.3). European societies took a lead in practising different measures of fertility control and are described by Reher as forerunners. By contrast the onset of the fertility transition in Africa occurred largely during the 1980s, 1990s and 2000s. Libya fits into this continental pattern with both mortality and fertility transitions being amongst the latest on the planet. As such Libya belongs to the group of nations described by Reher (2004) as latecomers (Fig 6.4), and El Gebel El Akhdar as a region in Libya would be a latecomer too, lagging behind the national trend.

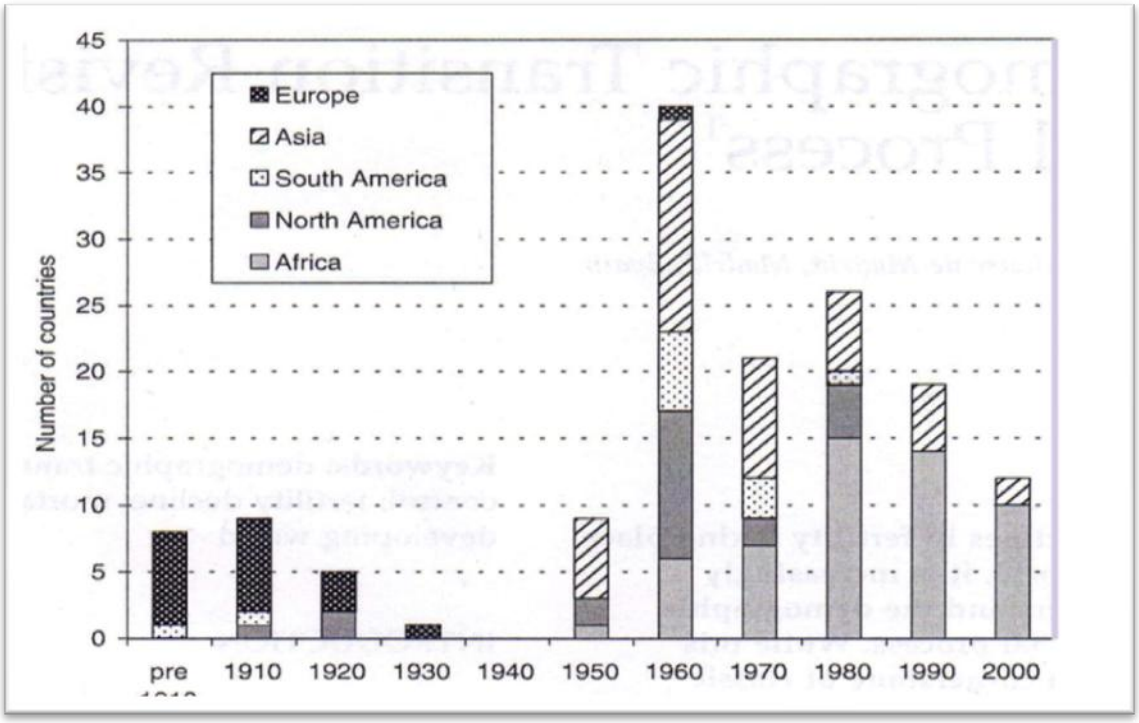


Figure 6-3: The onset of fertility transition by country and continent

Source: Reher, 2004.

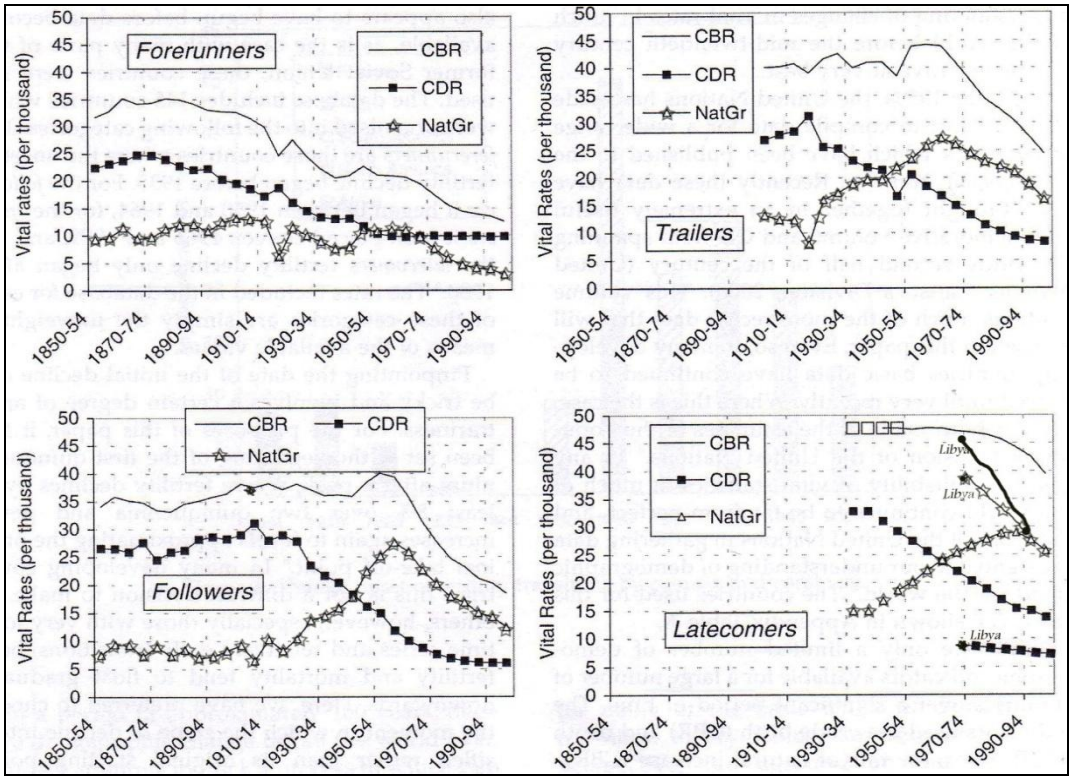


Figure 6-4: Profiles of demographic transition

Source: Reher, 2004.

The reason for the onset of demographic transition for the forerunners was the decline in the mortality rate which influenced the increase in the number of surviving children. Therefore, people became aware of how many children they may have and their income needs (Reher, 2004). Woods (1979) outlined these reasons for fertility decline in Europe during the latter half of the nineteenth century: the reduction in infant mortality, the diffusion and adoption of a range of technical innovations for birth control, reflecting change in cultural, religious, marriage and female education, modernisation, and industrialisation. However, the reason for the onset of demographic transition for the latecomers is a different story. Here, the reason was the spread of education particularly among females which impacted on female behaviour and attitudes toward the family size, outside world, their autonomy and their participation in the labour force.

6.5 CONCLUSION

The analysis of the influence of proximate determinants on fertility in El Gebel El Akhdar leads to the following conclusions. It has been proven by examining the Bongaarts' model, that certain biological effects have been especially important.

The investigation of marriage has shown that age at first marriage was a significant reason for fertility change with marriage age increasing from 18 to 23 years old (the Libyan census also confirmed that the mean age at first marriage increased from 18 for both sexes to 30 for females, 33 for males in 2006). The increase of age at first marriage not only reduces the potential number of years of childbearing but also increases women's exposure to education and the labour market.

Post partum infecundability has also been shown to be important. A significant relationship has been established between age, level of education and the practice of breastfeeding.

In summarising the effect of education on fertility behaviour, it has been argued that education has a significant effect on fertility through the proximate determinants with educated women tending to marry later, and engaging for a shorter time in breastfeeding (3-6 months). Older women who are characterised by no schooling and early age at first marriage are more likely to breastfeed for more than 12 months (12-24). On the other hand, younger females with higher levels of education, as well as late marriage age, generally

breastfeed for less than 9 months. It was shown, perhaps surprisingly, that there was no difference in the trends and the duration of breastfeeding between rural and urban women. In terms of the effect of age on the duration of breastfeeding, it was observed that the duration of breastfeeding was longer among those who married at an early age (15-19 years) who breastfed for 22-24 months.

The change of fertility in Libya including the study area has also been examined at the macro-scale, in terms of how fertility transition compares with Reher's theory (2004). This theory identified the onset of demographic transition in European societies as taking place in the late 19th century, while it can be said for Libya that it only began in the early 1990s. El Gebel El Akhdar in particular and Libya in general thus belong to the group of nations described by Reher as "latecomers".

Having explored the power of the proximate determinants in this chapter, the thesis now turns to consider the underlying factors accounting for fertility change in Libya. Attention focuses first (chapter 7) marriage, since this has been shown by Bongaarts (1982) and others to be such a powerful predictor, but from the perspective of this thesis it is also a factor that is heavily influenced by underlying socio-economic forces such as education. In chapter 8, the researcher introduces other children ever born as the dependent variable and seeks to analyse a range of other factors that the research literature would suggest influence fertility trends.

7 CHAPTER SEVEN: THE IMPACT OF SOCIO-ECONOMIC VARIABLES ON THE AGE AT FIRST MARRIAGE

7.1 INTRODUCTION

The key events in people's lives are birth, death and marriage but only marriage is a matter of choice. Even in Roman times, the right to exercise that choice was recognized as a principle of law. Although it has long been established in international human rights instruments, many smaller girls enter marriage without any chance of exercising their right to choose. (Umemoto, S. H. 2001, P2)

It was demonstrated in the previous chapter that the fertility rate in El Gebel El Akhdar is undergoing transition. It has also been shown that marriage as one of four most important proximate determinants of fertility (Bongaarts, 1982), has been a key driver of fertility transition in the study area. This chapter focuses specifically on age at first marriage seeking to explain what determines this key influence on fertility. The chapter examines how age at first marriage has changed over time in relation to socio-economic circumstances such as education, income, and occupation.

This chapter is divided into six sections. The first two sections concentrate on producing a model of age at first marriage for women currently in the reproductive cohorts. The third section presents some bi-variate relationships using cross-tabulations, a one way ANOVA and some correlations for the same group of women. This is to show the most important influences on marriage age. The fourth section investigates the impact of education levels on age at

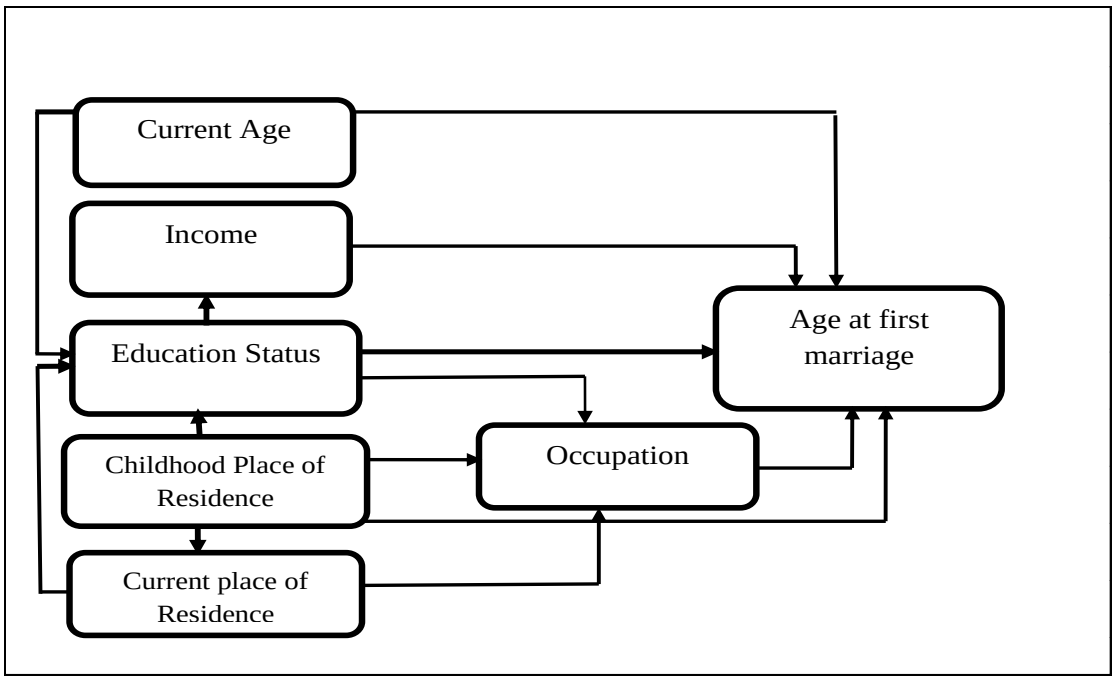
first marriage in El Gebel El Akhdar. In the penultimate section other variables will be studied such as age of males, family income per year, and place of birth and residence. Finally, the effect of all the explanatory variables on age at first marriage is studied for women of 40 years old and over.

7.2 THE MODEL OF DETERMINANTS OF AGE AT MARRIAGE

Socio-economic conditions have a major influence on age at first marriage. Key variables include education, employment, income, urbanisation, social, status and culture. Hirschman (1985) argued that the rising level of education, opportunities for wage employment prior to marriage and an increasing preference for independent spouse selection were among the likely reasons for the very significant delay in the timing of marriage that was observed in advanced economies during the twentieth century (Hirschman, 1985; Smith, 1980; Strange, 1976).

A delay in the age of marriage has the effect of increasing the proportion of women in a population "never married" at any particular point in time. A delay in marriage contributes to fertility decline by reducing a women's reproductive life. In the author's study area, there has been a noted increase in the proportion of females who have never married, rising from 35% in 1984 to 49% in 2006 (MoP, 1987; NAID, 2009). The percentage of males who have never married also increased from 47% in 1984 to 58% in 2006 (NAID, 2009). These figures of course include large numbers of children.

The determinants of age at first marriage are presented in a conceptual model in Figure 7.1. It indicates some of the most important explanatory variables of age at first marriage. These variables not only directly affect age at marriage, but also have indirect effects through variable such as education and occupation. The model also includes contextual variables, suggesting for example that place of birth and place of residence influence access to education and jobs as well as having an effect through conditioning attitudes to family formation. Another contextual factor is a woman's current age (under or over 45 years of age) with the assumption that older women, given their higher exposure to different cultural norms, could resist fertility decline, while younger women, characterised by higher education and engagement in employment, are likely to have different outcomes in terms of female fertility behaviour.



7-1: Conceptual model linking the explanatory variables to age at first marriage
Source: Adapted by the auther from Sheela J and Udinarayana A (2002, 26)

According to the model, there are therefore six explanatory variables. Each of these variables will be tested in the following discussion and they will be presented in four statistical models.

The first model examines the effect of female's levels of education on marriage age. This is the principal variable in the current study because education is hypothesised to be the main reason for delaying marriage. Andorka (1982) mentioned that female educational attainment is a key factor influencing reproductive behaviour. He suggested the relationship existed prior to the demographic transition and was reinforced during the transition with the parallel growth of education and fertility decline.

In addition, there is the effect of education on income. Tilson and Larson (2000) as well Takyi (2001) have suggested that women who marry early tend

to be poorly educated and subsequently have lower income and fewer assets later in life. Early marriage also signifies a poor start to family formation, and may be associated with marital instability and may create conditions that result in psycho-social problems (Tilson et al, 2000; Takyi, 2001). Therefore, the effect of education is not limited to the age of marriage, but to fertility effects later in life. For example, the South Australian Health Commission (SAHC) (1990) found that areas whose populations had low levels of educational attainment were also characterised by low female participation in the labour force, low incomes, low levels of skilled workers, single parent families and a high proportion of people living in public rental dwellings (SAHC, 1990).

The second model investigates the impact of male education on female's age at first marriage. There is an assumption of a correlation between male and female age at first marriage and that men with less education will not only marry women with low educational attainment, but that they will marry at a younger age.

The third model examines the impact of occupation and other socio-economic variables on marriage age. The assumption here is that as employment opportunities increase, so age at first marriage will rise. It is therefore logical to expect a differential between rural and urban areas, simply as a result of labour market differences, although contextual factors clearly have many other causal links with age at first marriage. In addition, income is thought to have the effect of increasing age at marriage. In the current research family income is

tested to determine its effect on marriage age. The last model adds place of birth (childhood place of residence) and current place of residence.

Before, applying these models; it is worth seeking a little clarification of the meaning and nature of marriage in the study area.

7.3 MARRIAGE

Although, there are different perspectives of the term of marriage, it will be concentrated only on the demographic and Islamic perspective of the meaning of marriage in the current survey.

7.3.1 Definition of marriage

The definition of marriage according to demographic view is a legal contract between a male and a female which initiated by the signing of agreement documents before witnesses and concluded by death or legal divorce (Bell, 1997).

While, Islamic definition of Marriage is "a contract defining the new association -the community of husband and wife - and their close co-operation of life" (Ippf, 1974, 140).

Marriage (nikah) in Islam is recognized as a highly religious sacred covenant. However, it is not religious in the sense of a sacrament, but rather in the sense of realizing the essence of Islam. In Islamic law, marriage is a civil contract legalizing intercourse and procreation. Marriage, reflecting the practical bent of

Islam, combines the nature of both 'ibadat' (worship) and 'muamalat' (social relation) (Pearl, 1987).

Consequently, marriage in Islamic regimes is an established societal norm and is seen as the only way of legitimate context for sexual gratification.

7.3.2 The age at first marriage in the study area

In the past, the majority of women married early in their teens. It was shown from the current survey that 261 of 600 (43%) of the women sample married in age less than 20 years old (15-19) and majority of them were from those who aged over 45. Also, majority of female in Libya tended to marry in early age in the early of 1970s where more than 40% of women got married in age group 15-19 at that time (Rashad et al, 2005). This was partly associated with the mobile nature of pastoral life which was based on agriculture and grazing. These circumstances encouraged people to marry early in order to have many children who could participate in the family's livelihood. This trend has changed in Libya after the discovery of oil and invests the oil. The major goals of modernization and development in the 1960s and 1970s were education and full employment as repeated in chapter 4. These impacted on women as much as on men. The result was a modification in the traditional role of women.

The consequence of mass education programmes and of other aspects of economic change included an impressive increase in the age at first marriage in all areas of Libya, including the study area. This situation is not limited to Libya, but is also found in other Arab countries such as Kuwait and United Arab

Emirates. For example, in the early 1970s about 40% of women aged 15-19 got married in Kuwait and Libya. These figures had declined by the mid 1990s to 5% and 1% respectively (Rashad et al, 2005).

7.3.3 Marriage arrangements

Marriage in El Gebel El Akhdar was traditionally seen as more a family matter than a personal affair. The sexes generally were unable to mix socially. Young men and women enjoyed few acquaintances among the opposite sex. In the past, parents arranged marriages for their children, finding a mate either through their own social contacts or through a professional matchmaker. Unions between children of brothers (cousins) were customarily preferred, or at least between close relatives. In recent decades, many marriages occurred outside these bounds, as a result of increased levels of education and internal migration.

Marriage in the study area is carried out according to Islamic law. Marriage is an agreement between the groom and bride or their families usually the father on behalf of the groom and the bride's father or her representative and this process must be performed in the presence of and in front of at least two Muslim witnesses. The amount of dowry is mentioned in the marriage contract. An official announcement of marriage should be made by both parties, groom and bride's families; religious ceremony is also preferable in such an occasion (Pearl, 1987).

According to law, the couples must have given their consent to the marriage and the contract establishes the terms of the union and outlines appropriate recourse if they are broken.

Polygamy is not as popular as before. The vast majority of marriage in Libya is monogamous; in the 2006 census less than 2.36% of women were in polygamy unions (NAID, 2009, 59).

7.4 STATISTICAL EXAMINATIONS OF EXPLANATORY VARIABLES AND AGE AT FIRST MARRIAGE

Before applying the above four models, it is helpful to examine some cross tabulations and understand the results of a one way ANOVA to find out the general effects of the levels of education on marriage.

7.4.1 One away ANOVA- education and age at first marriage

Table 7.1, indicates that the highest mean age of marriage is for those with university level education at about 26 years old (8 years later than un-educated women). The F statistic in Table 7.1 shows that as education levels rise there is a significant influence on age at first marriage (P<.000).

Table 7.1: The effect of education levels on marriage (all women)

Descriptives

women age at first marriage

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
None (no schooling)	181	17.59	3.291	.245	17.11	18.07	14	35
Primary school	76	18.99	3.404	.390	18.21	19.76	14	29
Elementary school	87	20.22	4.247	.455	19.31	21.12	14	38
Intermediate institute	106	21.69	3.509	.341	21.01	22.36	15	30
Secondary school	29	21.03	3.201	.594	19.82	22.25	16	30
University and College	121	25.86	3.208	.292	25.28	26.44	17	36
Total	600	20.71	4.569	.187	20.34	21.07	14	38

ANOVA

women age at first marriage

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	5320.487	5	1064.097	87.985	.000
Within Groups	7183.887	594	12.094		
Total	12504.373	599			

7.4.2 The impact of place of residence & birth & income on marriage (cross-tabulation)

Table 7.2 indicates the effect of place of residence on age of females at marriage. The highest percentage is for rural females married at between 15-19 years (about 42%), while the highest rate is for urban women who marry between 20 and 24 years of age (37%). Place of birth has a similar pattern as the place of residence. Women born in rural areas marry earlier than those born in urban areas. Most rural women marry between 15 and 19 (43%) while urban women got married between 20 and 24 (37%).

Table 7.2: Age at first marriage (all women) according to place of residence and income (%)

Place of residence							
Age band	10-14	15-19	20-24	25-29	30-34	35-39	Total
Rural	5.33	42.00	33.00	14.33	4.33	1.00	100.00
Urban	5.00	34.67	37.00	19.33	4.00	0.00	100.00
Place of birth							
Rural	5.56	43.40	32.64	13.89	3.47	1.04	100.00
Urban	4.81	33.65	37.18	19.55	4.81	0.00	100.00
Family Income Per Year							
less than 5000 Dinar	5.02	45.95	32.82	12.36	3.09	0.77	100.00
5000-10,000 D	4.53	32.04	38.19	20.39	4.53	0.32	100.00
More than 10,000 D	12.50	37.50	21.88	18.75	9.38	0.00	100.00

Calculated by author from field data

Family income also presents an interesting indication of the impact of income on marriage age. Those with less than 5000 Dinar ($4000) per year were more likely to marry at ages 15-19 (46%), while those with incomes between 5000 and10000) Dinar ($4000-9000) mainly married between 20 and 24 years of age.

7.4.3 Bivariate correlation of age at marriage with the independent variables

Table 7.3 shows that there is a strong relationship between male and female age at first marriage (R=0.724**) as well between female age at first marriage and level of education (0.629**). Both are statistically significant at the 99% level of confidence.

The correlation matrix also shows a significant relation between female occupation and age at marriage. The same is true for family income per year

(the total of all family members' income and income of other family activities such as farm, shops). Although, family income per year is not highly correlated with age at first marriage, it is statistically significant at 99% confidence level. A weaker correlation is evident with female place of birth. The other interesting relationship between the explanatory variables is between the level of education for the husband and wife, where there is strong relationship (0.821**). Not surprisingly, level of female education correlated with occupation (0.710**).

Table 7.3: The relationship between and within explanatory variables and age at first marriage (All women)

		women age at first marriage	Husband age marriage	Level of education of wife	level of education of husband	Wife Occupation	Husband Occupation	FIncomYr	Rural Urban	Women birth place
women age at first marriage	Pearson Correlation	1	.724**	.629**	.507**	.487**	-.036	.123**	.050	.093*
	Sig. (2-tailed)		.000	.000	.000	.000	.376	.002	.225	.022
	N	600	600	600	600	600	600	600	600	600
Husband age marriage	Pearson Correlation	.724**	1	.542**	.513**	.427**	.006	.128**	.031	.083*
	Sig. (2-tailed)	.000		.000	.000	.000	.893	.002	.442	.043
	N	600	600	600	600	600	600	600	600	600
Level of education of wife	Pearson Correlation	.629**	.542**	1	.821**	.710**	-.060	.242**	.115**	.194**
	Sig. (2-tailed)	.000	.000		.000	.000	.140	.000	.005	.000
	N	600	600	600	600	600	600	600	600	600
level of education of husband	Pearson Correlation	.507**	.513**	.821**	1	.624**	.001	.233**	.097*	.165**
	Sig. (2-tailed)	.000	.000	.000		.000	.987	.000	.018	.000
	N	600	600	600	600	600	600	600	600	600
Wife Occupation	Pearson Correlation	.487**	.427**	.710**	.624**	1	-.019	.238**	.106**	.165**
	Sig. (2-tailed)	.000	.000	.000	.000		.648	.000	.010	.000
	N	600	600	600	600	600	600	600	600	600
Husband Occupation	Pearson Correlation	-.036	.006	-.060	.001	-.019	1	.088*	.035	-.007
	Sig. (2-tailed)	.376	.893	.140	.987	.648		.031	.396	.860
	N	600	600	600	600	600	600	600	600	600
Family Income Per year	Pearson Correlation	.123**	.128**	.242**	.233**	.238**	.088*	1	-.014	.000
	Sig. (2-tailed)	.002	.002	.000	.000	.000	.031		.728	.996
	N	600	600	600	600	600	600	600	600	600
Rural Urban	Pearson Correlation	.050	.031	.115**	.097*	.106**	.035	-.014	1	.634**
	Sig. (2-tailed)	.225	.442	.005	.018	.010	.396	.728		.000
	N	600	600	600	600	600	600	600	600	600
Women birth place	Pearson Correlation	.093*	.083*	.194**	.165**	.165**	-.007	.000	.634**	1
	Sig. (2-tailed)	.022	.043	.000	.000	.000	.860	.996	.000	
	N	600	600	600	600	600	600	600	600	600

7.5 MODEL'S COMPONENTS

Having attempted some basic descriptive statistics, the analysis now turns to regression modelling. Linear regression is a statistical procedure for predicting the value of a dependent variable from an independent variable when the relationship between the variables can be described with a linear model. Accordingly, female age at first marriage was selected as the key dependent variable (continuous) for examination in relation to independent variables such as education, occupation, income, place of birth and place of residence (mainly categorical variables). The procedure required the creation of dummy variables ([0] was used for reference or excluded categories and [1] indicated the tested category) as listed in Table 7.4. Table 7.5 shows the summary statistics for each of the independent variables in relation to the survey data collected by the author.

Table 7.4: List of dummies for explanatory variables used in the regression models

Assignment Data Set

Aggregated Data for 600 Females from EL Gebel El Akdar in 2008/09

Dependent Variable: **Age at first marriage**

Explanatory variables:

- **Level of female and male's education (Dummies)**

	Female's Dummies	Male's Dummies
0-No Schooling	(Dummy1NoSch)	(Dummy1HusNoSchool)
1-2- Primary & Elementary level	(Dummy2PrElm)	(Dummy2HusPriElem)
3- Institute level	(Dummy3Instit)	(Dummy3Instit).
4-Secondary Level	(Dummy4Secon)	(Dummy4HusSec
5-University level	(Dummy5Univers)	(Dummy5HusUnivr)

- **Females and males Occupation according to the economic sectors**

0- None (Dummy Wife Occupation None
1- Primary and Secondary (Dummy Wife occupation Primary Secondary
2- Tertiary (Dummy Wife occupation Tertiary)
3- Not defined (Dummy Wife occupation Not defined)
4- Retired (Dummy Wife occupation Retired)

Husband's occupation

1- None (Dummy Husband occupation None)
2- Primary & Secondary (Dummy Husband occupation Primary)
3- Tertiary (Dummy Husband Occupation Tertiary)
4- Not defined (Dummy Husband Occupation Not defined)
5- Retired (Dummy Husband occupation Retired)

- **Age of Husband at marriage**
- **Family income per year**

1- Less than 5000 Dinar (Dummy Family income Per Year less 5000)
2- 5000-10,000 D (Dummy Family Income 5-10)
3- More than 10,000 D (Dummy Family Income More 10,000)

- **Place of female's birth**

1- Rural (Dummy Place of birth Rural)
2- Urban (Dummy Place of Birth Urban)

- **Place of Residence**

1- Rural (Dummy Rural)
2- Urban (Dummy Urban)

Table 7.5: Statistics summary of model's variables

	Number of all women (45-&45+)	No of women 40+
Levels of education for females		
No Schooling	181	173
Primary& Elementary	162	107
Institute	106	60
Secondary	29	11
University	122	25
Total	600	376
Levels of education for males		
No Schooling	110	106
Primary& Elementary	166	130
Institute	96	61
Secondary	63	35
University	165	44
Total	600	376
Occupation/economic sectors (females)		
None	311	244
Primary & Secondary	12	7
Tertiary	262	115
Not defined	15	10
Retired	0	0
Total	600	376
Occupation/economic sectors (males)		
None	62	47
Primary and Secondary	108	65
Tertiary	332	189
Not defined	60	37
Retired	38	38
Total	600	376
Family income per year		
less than 5000 Dinar	259	171
5000-10,000 D	309	184
More than 10,000 D	32	21
Total	600	376
Place of birth		
Rural	288	197
Urban	312	179
Total	600	376
Place of residence		
Rural	300	192
Urban	300	184
Total	600	376

7.6 MODEL (1): THE EFFECT OF FEMALE EDUCATION ON THE AGE OF FEMALE AT FIRST MARRIAGE (ALL WOMEN)

In the first model the effect of the levels of women's education on the age of females at first marriage is examined for all women (over 45 and 45 and less). Table 7.6 indicates that there is significant impact on age of marriage for each increase in the level of female education. All levels have a significant effect, but the strongest impact appears to be associated with university education (university-educated females marry 8.179 years later than uneducated females). When, all education categories are considered, female education level on its own accounts for 41% of all the variation in the model of female age at first marriage. The difference between (R) in the model 0.643 and in correlation-table 0.629 can be attributed to creating dummies for education levels in the model.

Table 7.6: The effect of female education on age at first marriage

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.643[a]	.413	.409	3.512

a. Predictors: (Constant), Dummy5Univers, Dummy4Secon, Dummy3Instit, Dummy2PrElm

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	5163.701	4	1290.925	104.636	.000[a]
	Residual	7340.672	595	12.337		
	Total	12504.373	599			

a. Predictors: (Constant), Dummy5Univers, Dummy4Secon, Dummy3Instit, Dummy2PrElm

b. Dependent Variable: women age at first marriage

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	17.591	.261		67.379	.000
	Dummy2PrElm	2.082	.380	.202	5.480	.000
	Dummy3Instit	4.098	.430	.342	9.538	.000
	Dummy4Secon	3.443	.703	.162	4.901	.000
	Dummy5Univers	8.179	.411	.721	19.880	.000

a. Dependent Variable: women age at first marriage

7.7 MODEL (2): THE IMPACT OF MALE AND FEMALE EDUCATION ON AGE OF FEMALES AT FIRST MARRIAGE

In model 2 male education levels are added to the previous model variable. Before adding this variable, it is useful to examine its effect on the age at first marriage separately. Table 7.7 confirms that there is an impact of male age at marriage with a strong positive relationship being found between male education and female age at marriage (R= 0.248) with the correlation being significant at p=0.001; all levels of male education are significant, but the strongest impact appears to be associated with university education, where those whose husbands have higher level of education got married 6 years later than those whose husband had no education. (R in this model is different compared with the correlation table, because the effect of creating dummy variables in this model).

However, when male education levels are added to female education levels in a composite modelling of education effects on age at first marriage (Table 7.8), the effect of male education did not add extra explanatory value to the variability in the model, with variables relating to female education being the only ones that proved significant in this second model, and with no overall gain

in the level of explanation achieved (see again Model 1, Table 7.6). Although, all levels of female education are significant, the levels of male education present an insignificant effect because the effect of the combination of variables, especially between the level of a wife and husband's education (0.82**), which hides the significance of male education on age at first marriage.

Table 7.7: The effect of husband's level of education on age at first marriage

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.503[a]	.253	.248	3.961

a. Predictors: (Constant), Dummy5HusUnivr, Dummy4HusSec, Dummy3Instit, Dummy2HusPriElem

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3168.122	4	792.031	50.476	.000[a]
	Residual	9336.251	595	15.691		
	Total	12504.373	599			

a. Predictors: (Constant), Dummy5HusUnivr, Dummy4HusSec, Dummy3Instit, Dummy2HusPriElem

b. Dependent Variable: women age at first marriage

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	17.536	.378		46.431	.000
	Dummy2HusPriElem	1.518	.487	.149	3.117	.002
	Dummy3Instit	3.578	.553	.287	6.468	.000
	Dummy4HusSec	4.670	.626	.314	7.462	.000
	Dummy5HusUnivr	6.136	.488	.600	12.585	.000

a. Dependent Variable: women age at first marriage

Table 7.8: The effect of females and male levels of education on age at first marriage

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.644[a]	.414	.406	3.520

a. Predictors: (Constant), Dummy5HusUnivr, Dummy3Instit, Dummy4Secon, Dummy2PrElm, Dummy4HusSec, Dummy3Instit, Dummy2HusPriElem, Dummy5Univers

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	5181.371	8	647.671	52.270	.000[a]
	Residual	7323.002	591	12.391		
	Total	12504.373	599			

a. Predictors: (Constant), Dummy5HusUnivr, Dummy3Instit, Dummy4Secon, Dummy2PrElm, Dummy4HusSec, Dummy3Instit, Dummy2HusPriElem, Dummy5Univers

b. Dependent Variable: women age at first marriage

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	17.536	.336		52.250	.000
	Dummy2PrElm	1.984	.513	.193	3.864	.000
	Dummy3Instit	4.006	.662	.335	6.050	.000
	Dummy4Secon	3.239	.874	.152	3.704	.000
	Dummy5Univers	8.148	.703	.718	11.596	.000
	Dummy2HusPriElem	.168	.543	.016	.309	.757
	Dummy3Instit	-.052	.696	-.004	-.075	.940
	Dummy4HusSec	.588	.791	.039	.743	.458
	Dummy5HusUnivr	.051	.747	.005	.068	.946

a. Dependent Variable: women age at first marriage

7.8 MODEL (3): THE EFFECT OF EDUCATION, OCCUPATION, INCOME AND MALE AGE ON AGE AT FIRST MARRIAGE

In this model other explanatory variables are added: occupations of females and males, income, age of males at marriage. Before applying the model it is worth examining the power of individual variables in explaining marriage age.

Table 7.9 reveals there is positive statistically significant relationship between occupation and marriage age (R=0.487). Predicted age of females at first

marriage increases from 18.453 among unemployed females to 23.33 among those who are in paid work (primary and secondary sectors). Those in tertiary sector occupations seem to marry up to 5 years later than unemployed women (Table 7.10). By contrast place-based variables proved unimportant in this analysis.

Table 7.9: Female's occupation and age at first marriage

Correlations

		women age at first marriage	Wife Occupation
women age at first marriage	Pearson Correlation	1	.487**
	Sig. (2-tailed)		.000
	N	600	600
Wife Occupation	Pearson Correlation	.487**	1
	Sig. (2-tailed)	.000	
	N	600	600

**. Correlation is significant at the 0.01 level (2-tailed).

Table 7.10: Women's occupation and age at first marriage

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	18.453	.222		83.124	.000
	Dummy Wife occupation Primary Secondary	4.880	1.152	.150	4.237	.000
	Dummy Wife occupation Tertiary	4.806	.328	.522	14.639	.000
	Dummy Wife occupation Not defined	2.280	1.035	.078	2.203	.028

a. Dependent Variable: women age at first marriage

In terms of income Table 7.11 shows a positive relationship between family income and age at first marriage. Although the overall effect is statistically significant (R=0.123), the impact is uneven (Table 7.12) with an increase in age of marriage for those from households with modest incomes of between 5000-10,000 Dinars relative to poorer households, but no significant change for households on higher incomes.

Table 7.11: Income and age at first marriage

Correlations

		women age at first marriage	FIncomYr
women age at first marriage	Pearson Correlation	1	.123**
	Sig. (2-tailed)		.002
	N	600	600
FIncomYr	Pearson Correlation	.123**	1
	Sig. (2-tailed)	.002	
	N	600	600

**. Correlation is significant at the 0.01 level (2-tailed).

Table 7.12: The impact of income on age at first marriage

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	19.961	.281		70.934	.000
	Dummy Family Income 5-10	1.356	.382	.148	3.553	.000
	Dummy Family Income More 10,000	.882	.849	.043	1.040	.299

a. Dependent Variable: women age at first marriage

For the effect of male age at first marriage Table 7.13 shows a strong relationship (R=0.724) that is also statistically significant P>.001.

Table 7.13: The effect of male age at marriage on female marriage age

Correlations

		women age at first marriage	Husband age marriage
women age at first marriage	Pearson Correlation	1	.724**
	Sig. (2-tailed)		.000
	N	600	600
Husband age marriage	Pearson Correlation	.724**	1
	Sig. (2-tailed)	.000	
	N	600	600

**. Correlation is significant at the 0.01 level (2-tailed).

Model 3 enters all these variables (female education levels, occupations of females and males, income, age of males at marriage) into a composite analysis to explore the relative strength of each variable in explaining female age at first marriage. Table 7.14 shows the outcome. Model 3 suggests a significant positive relationship between the explanatory variables and marriage

age with 62 per cent of the variability in age at first marriage being accounted for.

Table 7.14: The effect of education levels, occupation, and income and male age on age at first marriage

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.794[a]	.631	.622	2.810

a. Predictors: (Constant), Husband age marriage, Dummy Husband occupation Primary , Dummy Wife occupation Primary Secondary , Dummy Wife occupation Not defined , Dummy Family Income More 10,000 , Dummy4Secon, Dummy Husband occupation Retired , Dummy Husband Occupation Not defined , Dummy3Instit, Dummy Family Income 5-10 , Dummy2PrElm, Dummy Wife occupation Tertiary , Dummy Husband Occupation Teriatry , Dummy5Univers

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	7884.339	14	563.167	71.310	.000[a]
	Residual	4620.034	585	7.897		
	Total	12504.373	599			

a. Predictors: (Constant), Husband age marriage, Dummy Husband occupation Primary , Dummy Wife occupation Primary Secondary , Dummy Wife occupation Not defined , Dummy Family Income More 10,000 , Dummy4Secon, Dummy Husband occupation Retired , Dummy Husband Occupation Not defined , Dummy3Instit, Dummy Family Income 5-10 , Dummy2PrElm, Dummy Wife occupation Tertiary , Dummy Husband Occupation Teriatry , Dummy5Univers

b. Dependent Variable: women age at first marriage

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	9.434	.605		15.596	.000
	Dummy2PrElm	.540	.342	.052	1.579	.115
	Dummy3Instit	1.143	.520	.095	2.199	.028
	Dummy4Secon	.560	.619	.026	.904	.366
	Dummy5Univers	3.881	.534	.342	7.268	.000
	Dummy Wife occupation Primary Secondary	2.608	.861	.080	3.030	.003
	Dummy Wife occupation Tertiary	.880	.399	.096	2.209	.028
	Dummy Wife occupation Not defined	-.228	.780	-.008	-.292	.770
	Dummy Husband occupation Primary	-.300	.464	-.025	-.647	.518
	Dummy Husband Occupation Teriatry	-.520	.408	-.057	-1.274	.203
	Dummy Husband Occupation Not defined	-.415	.519	-.027	-.799	.425
	Dummy Husband occupation Retired	-.281	.596	-.015	-.471	.638
	Dummy Family Income 5-10	-.296	.258	-.032	-1.146	.252
	Dummy Family Income More 10,000	-.821	.542	-.040	-1.514	.131
	Husband age marriage	.405	.022	.541	18.008	.000

a. Dependent Variable: women age at first marriage

However, by seeking to establish a multivariate model some of the variables which had been significant when analysed on their own now cease to add any extra explanation because of their covariance with other variables in the model. Those variables that emerge as the most powerful are women with university level education and male age at first marriage (both still significant at P>0.001). Female occupation (primary and secondary sectors) shows significance influence on age at first marriage, while male occupation and family income appear to have no significant independent effect. This may confirm that the changing status of women in Libya is of growing importance in understanding family formation. More women are now participating in waged jobs and although this remains less important than female education in affecting age at marriage, it appears to be having some effect.

7.9 MODELS (4): THE EFFECT OF EDUCATION, OCCUPATION, INCOME AND MALE AGE AND PLACE OF BIRTH AND RESIDENCE ON MARRIAGE AGE

The model investigates contextual influences on age at first marriage. In particular the effects of place of birth and place of residence are added into model along with the other significant variables. The independent effect of the relation between place of birth and age at first marriage is illustrated in Table 7.15. Although the relationship is not strong, it is statistically significant at the 95% level if a two tailed test is used. Similar findings emerged when place of residence was investigated.

Table 7.15: Place of birth and marriage age

Correlations

		women age at first marriage	Women birth place
women age at first marriage	Pearson Correlation	1	.093*
	Sig. (2-tailed)		.022
	N	600	600
Women birth place	Pearson Correlation	.093*	1
	Sig. (2-tailed)	.022	
	N	600	600

*. Correlation is significant at the 0.05 level (2-tailed).

Not surprisingly when place of birth and place of residence variables were added to the multivariate model, they did not emerge as adding significantly to the overall model (Table 7.16: Model 4), thus contradicting the findings found in parts of the literature that suggest that rural-urban differences remain a key dimension of fertility and marriage differentials in the global south.

Table 7.16: The effect of adding place of birth and residence on marriage age

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.794[a]	.630	.622	2.808

a. Predictors: (Constant), Dummy Urban , Dummy4Secon, Dummy Wife occupation Tertiary , Dummy Family Income More 10,000 , Dummy Wife occupation Primary Secondary , Dummy Wife occupation Not defined , Dummy2PrElm, Dummy Family Income 5-10 , Husband age marriage, Dummy3Instit, Dummy Place of Birth Urban , Dummy5Univers

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	7874.866	12	656.239	83.208	.000[a]
	Residual	4629.508	587	7.887		
	Total	12504.373	599			

a. Predictors: (Constant), Dummy Urban , Dummy4Secon, Dummy Wife occupation Tertiary , Dummy Family Income More 10,000 , Dummy Wife occupation Primary Secondary , Dummy Wife occupation Not defined , Dummy2PrElm, Dummy Family Income 5-10 , Husband age marriage, Dummy3Instit, Dummy Place of Birth Urban , Dummy5Univers

b. Dependent Variable: women age at first marriage

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	9.219	.553		16.682	.000
	Dummy2PrElm	.531	.334	.052	1.590	.112
	Dummy3Instit	1.126	.514	.094	2.193	.029
	Dummy4Secon	.539	.612	.025	.881	.379
	Dummy5Univers	3.905	.531	.344	7.348	.000
	Dummy Wife occupation Primary Secondary	2.630	.862	.081	3.052	.002
	Dummy Wife occupation Tertiary	.861	.398	.094	2.162	.031
	Dummy Wife occupation Not defined	-.143	.780	-.005	-.184	.854
	Dummy Family Income 5-10	-.376	.252	-.041	-1.495	.135
	Dummy Family Income More 10,000	-.878	.534	-.043	-1.643	.101
	Husband age marriage	.403	.022	.538	17.954	.000
	Dummy Place of Birth Urban	-.228	.303	-.025	-.751	.453
	Dummy Urban	.066	.301	.007	.219	.827

a. Dependent Variable: women age at first marriage

7.10 THE EFFECT OF SOCIO-ECONOMIC VARIABLES ON AGE AT FIRST MARRIAGE FOR WOMEN AGED 40+

The previous modelling examined the effect of socio-economic variables on age at first marriage for all women (over and less than 45). In the next section, analysis turns to examine the patterns found amongst older women over 40 years of age. This was done to explore whether over time there has been a change in the determinants of age at first marriage, with the assumption being that in the past fewer women received secondary and higher education and fewer participated in the waged labour market.

The analysis for women of 40 years of age and older has showed slightly different relationships from those uncovered in Tables (7.6-7.16). The effect of education levels was slightly weaker, but the relationship between education and age at first marriage remained highly significant (R square= 0.25; P>.001).

Linear regression gave a best-fit age at first marriage of 17.58 years for uneducated women in this analysis, increasing to 19.22 among females with primary or elementary levels, rising to 22.18 among women with secondary level. It was much higher (25.24 years) among those with university level education. Once again male education was significantly associated with women's age at first marriage, but added no extra explanation to a multivariate model.

When other socio-economic variables (female occupation, income and husband's age at first marriage) were introduced to the model, the level of explanation (R square= 0.55) did however rise. Once again place of residence and birth were insignificant predictors of age at first marriage (Table 7.17).

Comparing the effect of these variables for women over 40 and for all women (Previous model 4), the effect of family income is different with it being more important for older women. This would seem to suggest that in the past wealth was a significant influence on age of first marriage but that with passage of time this has diminished as education has risen in importance.

Table 7.17: The effect of adding place of birth and residence on age at marriage for women 40+

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	10.148	.651		15.596	.000
	Dummy2PrElm	.337	.398	.036	.846	.398
	Dummy3Instit	1.197	.649	.104	1.845	.066
	Dummy4Secon	1.806	.962	.072	1.879	.061
	Dummy5Univers	4.330	.792	.256	5.469	.000
	Dummy Wife occupation Primary Secondary	3.728	1.152	.120	3.235	.001
	Dummy Wife occupation Tertiary	1.063	.511	.116	2.078	.038
	Dummy Wife occupation Not defined	-.246	.983	-.009	-.250	.802
	Dummy Family Income 5-10	-.925	.322	-.110	-2.869	.004
	Dummy Family Income More 10,000	-1.325	.671	-.072	-1.975	.049
	Dummy Place of Birth Urban	-.218	.401	-.026	-.543	.587
	Dummy Urban	.033	.400	.004	.083	.934
	Husband age marriage	.371	.026	.547	14.158	.000

a. Dependent Variable: women age at first marriage

7.11 CONCLUSIONS

This chapter has tried to explain the determinants of age at first marriage as part of a wider investigation of the influences on fertility in El Gebel El Akhdar. From the range of socio-economic variables initially hypothesised to be important (Figure 6.1), only a small number proved to be statistically significant (Figure 7.2).

However, education performed as expected with female education level being shown to contribute up to 8 years to the age of marriage if one compares the results for uneducated females with those for women with university qualifications. Since educated people tended to marry their peers the result was

that male education contributed to an increase of age at first marriage of 6 years later. When male education was added to the model, there was no observed effect due to collinearity which existed between female and male education (0.82**).

Inevitably education level was correlated with occupation, which in turn had both a direct and indirect effect on marriage age. In particular it was female occupations that were significant. It was found that employed women married on average five years later than unemployed females (Table 7.10).

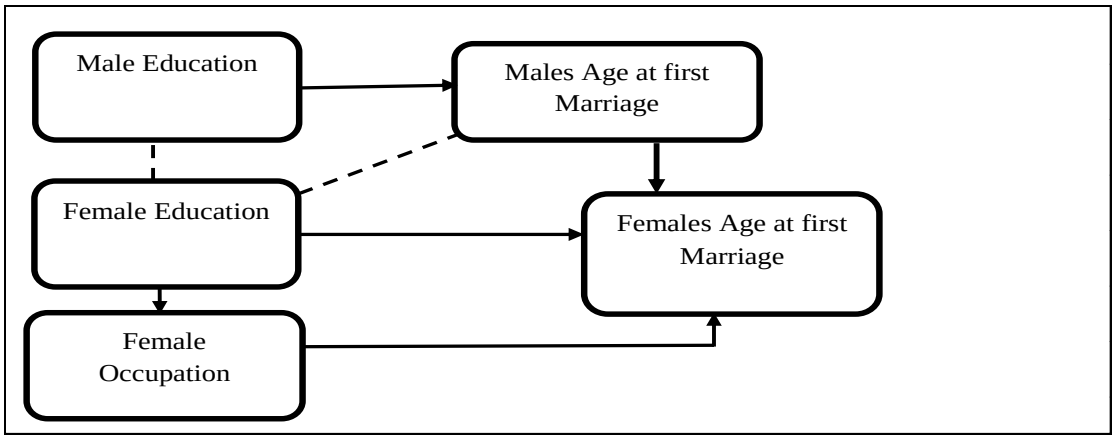


Figure 7-2: The explanatory variables on age at first marriage in study area

This chapter has therefore provided evidence of which variables are the most important determinants of age at first marriage which in turn is a strong influence on fertility. As education levels rise and as female engagement in a range of occupations advance, it can be anticipated that there will be further delays in the age at first marriage and a reduction in the amount of time women spend in sexual unions during their reproductive lifetimes.

8 CHAPTER EIGHT: EFFECTS OF SOCIO-ECONOMIC VARIABLES ON FERTILITY

8.1 INTRODUCTION

In the preceding chapter, age at first marriage as one of the most important proximate determinants of fertility was investigated in relation to the influence of socio-economic factors such as education, occupation, income, and place of birth and residence. The findings demonstrated that these major explanatory variables had the effect of delaying age at first marriage. Education was shown to be the most important factor in delaying marriage. In the current chapter the attention turns from investigating these indirect effects to consider instead the direct effects of socio-economic circumstances on fertility.

The chapter is organised as follows. The following section sets out a conceptual model which highlights the varying effects socio-economic variables can have on fertility. Using this conceptual model as a base, the third section then discusses the statistical methods which have been employed to explore the effect of socio-economic variables on fertility, as well as operationalisation of a fertility variable measured using the number of children ever born (CEB). The fourth section contains results from the statistical analysis, encompassing a range of models fitted to explore the effects of different socio economic variables on the measure of CEB just introduced. Finally the fifth section provides a summary and review of the main effects revealed by this study of fertility behaviour.

8.2 MODEL OF THE EFFECT OF SOCIO-ECONOMIC VARIABLES ON FERTILITY

The onset of the fertility decline in Europe has been attributed to the rising economic costs of raising children and the reduced economic benefits of having children as society experiences the fruits of economic progress (Thompson, 1929; Notestein, 1953). As noted in the literature review (chapter 2), similar suppositions have been made about fertility trends in developing countries, although detailed research has found that the timing of the fertility transition has been driven by rather different socio-economic circumstances. Nevertheless education remains one of the key social indices that have been shown in country after country to have a strong co-relationship with fertility behaviours (Cleland, 2003; Basu, 2002), and this has arisen not only because of indirect effects associated with delays in the age of marriage (Westoff, 1992; Smith et al, 1980; Minh, 1997) but also direct effects as discussed below.

The following investigation starts from a schematic model of the effect of socio-economic characteristics (including education) on the fertility experiences of mothers. The model (Figure 8.1) indicates hypothetically how these variables affect fertility and how they interact with each other.

In what follows each variable is discussed in relation to its potential influence on fertility. The model tries to show that fertility behaviour can be seen as the consequence of the interaction of many social, economic, biological, and

political variables. These are set in the context of the life-environment of people.

"Reproductive behaviour, as many other aspects concerning the human being, can be understood as the result of co-evolution of the cultural, socio-economic and biological systems that each population develops according to the environment it lives in" (Hernanz et al, 2010, 35).

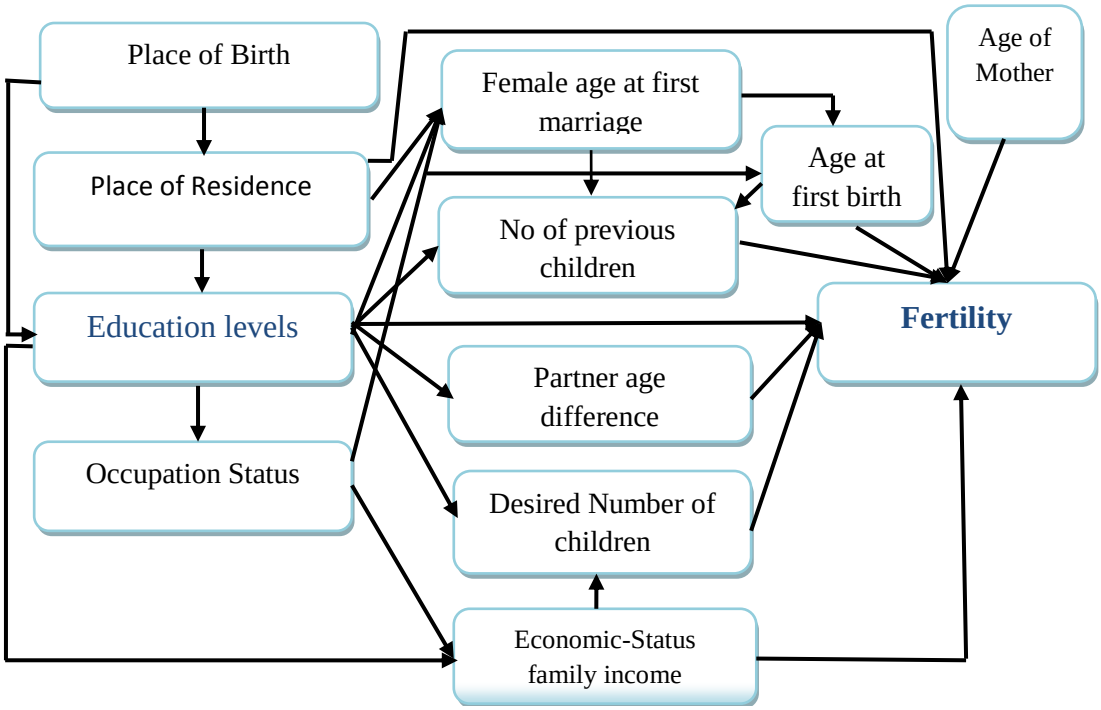


Figure 8-1: Conceptual schema of the impact of socio-economic variables on fertility

The model shows four possible determinants (location, education, economic status and occupation) being of primary importance. They impact on fertility via other correlates of fertility (such as age mother at first marriage and birth, desired number of children and age difference), in addition to their direct fertility effects. This leads to the central hypothesis of this thesis that female education has a statistically significant effect on fertility behaviour and that this can be seen to operate both directly and indirectly.

A great deal of demographic research has concentrated on female educational achievements, as this has long been recognised as a key factor influencing reproductive behaviour (Andorka, 1982). The relationship between education and fertility existed prior to the demographic transition, but Andorka comments that its significance was reinforced during the transition with the parallel growth in access to education and the decline of fertility (Andorka, 1978, 1982). Caldwell and Caldwell (2001) emphasize that fertility decline began when primary schooling became almost universal, and as secondary schooling moved in this direction. Blake and Del Pinal (1982) suggest education is a good proxy for a variety of fertility-related conditions including knowledge of birth control, level of aspiration for oneself and one's children, social class, lifestyle and income:

"Education can certainly alter parents' perceptions of the advantages of smaller or larger families, in a number of ways: they may acquire social or economic aspirations with which children would interfere; they may acquire aspirations for their children - not least the simple one of ensuring their children's

education - which cannot be satisfied for more than a limited number of offspring. Education may affect the status of women and thereby fertility. If education increases parents' earnings and children reduce them, this could also be a mechanism underlying the relationship.... education may affect both attitudes towards contraception and the ability to understand and make use of particular contraceptive methods" (Cassen, 1976,790).

The effect of education on fertility "has been found to reduce the desirability of large families by increasing the aspirations for upward mobility by enhancing the prospects for gainful employment outside the home which competes with childbearing and childrearing and by reducing the perceived economic utility of children and, thus the demand of parents for them....Education increases exposure to information concerning family planning and either directly provides or facilitates the acquisition of information on contraceptive devices and methods and their use" (Tanfer, 1984,183-184).

Thus, the direct effect of being educated on fertility can be understood from the preference of educated women for a small number of offspring and smaller family size; as well they aware of use contraception, and have greater negotiation skills on reproductive matters (UN, 2001b, 10).

An indirect effect of education on female fertility behaviour is not only in terms of the increase of age at first marriage and other proximate determinants as discussed in chapter 6 and 7.

"Education is regarded as being the prime catalyst in this process because increases in educational attainment are likely to significantly affect both age at marriage and the duration to first birth.... As with the age at marriage, age at first birth is also significant in the process of demographic transition because a higher age at first birth is typically associated with a lower lifetime fertility rate" (Gangadharan, 2001, 2).

Also, education may have an effect on fertility by the reduction of the number of births after the first child "Wife's education may delay the first birth, accelerate the pace at which the first few children are born, and sharply curtail any subsequent births.... fertility behaviour is most responsive to socioeconomic position in the middle and later childbearing years" (Entwisle et al, 1985, 619- 620).

The modelling in this chapter also considers occupation. It is assumed to be one of the most important socio-economic factors affecting fertility. The results of some studies in Europe and America have indicated a universal inverse relationship between fertility and both male and female occupation status. At the broadest level, manual workers have higher fertility than non-manual workers and particularly farm workers have higher fertility than those employed in non-agricultural occupations (Andorka, 1978, 1982; Woods, 2000). O'Connell and Rogers 1982 indicated that employed women have lower fertility than unemployed females and for employed women fertility is higher for part time than for those working full time (O'Connell et al, 1982). It is assumed that

"Women with formal-sector jobs would appear to confront the highest opportunity cost of childbearing and therefore have the lowest demand for larger numbers of children and the highest motivation for contraception. Better-educated women and women employed in the modern sector are expected to be more likely to practice contraception, since the number of children they desire is expected to be relatively low and their infant and child mortality rate will also be relatively low" (Shapiro et al,1994, 99).

Employment outside the home competes with the time available for childrearing. Thus it reduces the demand by parents for having children (Tanfer, 1984). The influence of female employment on fertility behaviour emerges through reducing family size by making it more costly for the mother to take time to rear children. Whilst the effect of employment in modern jobs is quite clear. While there is some doubt about the effect of female employment in agriculture or in cottage industry in rural society (Beguy, 2009; Standing, 1983; Becker, 1993). Accordingly, the current chapter investigates the effect of occupation (among female workers) on fertility behaviour.

In addition, the effect of education and occupation correlates with economic status. Educated women have a better opportunity to have a good career with high income. Therefore, the effect of education is not only on employment but on income too.

Economic status [which is measured here by family income per year] can be considered to be one of the most important determinants of fertility and it plays

a great part in fertility behaviour. The relationship is complex due to the effect of other social factors as well the difficulty of interpretation of the relation between income and fertility. In addition, people are sensitive about giving specific details of their income. Also, one should be aware that a family's current income might not be a true reflection of a previous income.

Becker has argued that social pressures "force" richer families to spend more on children, and this increases the cost of children to the rich. This higher cost is supposed to explain why richer families have fewer children than others (Becker, 1960, 214).

The relationship between income and fertility could have an influence on other variables such as education, health, and employment (Bulatao, 1984). Therefore, "an increase in family income in and of itself, is not as important as the changes in circumstances that it permits these factors such as better health or increased access to education which leads to reductions in family size" (Rich, 1973,16).

In addition, a husband's income has an effect in fertility behaviour particularly in Islamic countries where the husband is responsible for household expenditure:

"Higher income would therefore increase the likelihood of the wife's staying at home, reducing possible conflict with and possibly increasing the motivation to care for many children" (Bulatao, 1984,11).

The model shown in Figure 8.1 also hypothesis that place of residence and birth have a significant impact on fertility. The effect of place of residence on fertility might be because of a variation of fertility rates between rural and urban settlements associated with different cultures and livelihood systems.

It is assumed that fertility tends to be higher among rural women. It is more likely that "The greater exposure to many aspects of modernisation and development ... imply higher net social and economic costs of children" (Singh and Casterline, 1985, 212).

Earlier analysis in this thesis seemed to suggest that location effects were important in understanding fertility differences between rural and urban areas as mentioned in relation to the text relating to TFR and TMFR in El Gebel El Akhdar. Rural women certainly had more children than urban women in the early of 1970s and 1980s (the effect of place of residence). The effect of place may also be important through its association with patterns of mobility with migrants from rural to urban areas having higher fertility than those born in urban areas (the effect of place of birth- those who rural-born or urban-born).

Another key influence on fertility shown in Figure 8.1 is desired family size. The effect of family planning on fertility behaviours and attitudes is hypothesized to impact in a variety of ways. The effect can be understood from the European experience where the introduction of public and private family planning programmes was a key factor in legitimating new norms of lower

family size and in the spread of a variety of means of fertility control (Hirschman et al, 1990).

The desired number of children that couples desire is a significant indicator of family planning. In developing societies, people still prefer larger numbers of children simply an account of the security that they provide to their parents in later life.

"In many developing countries children are very important, often the only source of security to parents in old age, sons especially may be essential to survival" (Potts and Selman, 1979, 85).

Unquestionably, educated people are more knowledgeable about planning family sizes than others and may encourage people to practise various methods of fertility control (Axinn et al, 2001 & Caldwell et al, 2002). Educated females have a propensity to desire smaller family size, and they are more likely to control fertility by using different methods of contraception.

However, it should be mentioned that gender preference also affects the desired number of children. Child gender preference has been shown to be particularly powerful in patriarchal Islamic societies.

Many societies still have a strong preference for sons “families with a higher proportion of daughters may have additional births in order to have some targeted number of sons” (Hassan, 1991, 353). Therefore, "preference for one

sex over the other for whatever reasons may lead to higher fertility both at individual and societal level" (Chaudhury, 1982, 34).

Another factor identified in Figure 8.1 that might have an effect on fertility behaviour is partner age difference. Inevitably, educated females tend to marry their peers and this leads to a higher chance of there being little age difference between spouses; this is not true for poor education women who are much more likely to be married to older husbands.

Overall then, Figure 8.1 makes explicit the links between a range of socio-economic background variables and their potential effects on CEB. Modelling conducted for this chapter provides a means to assess how these variables feature in explaining fertility decline. This includes trying to specify interaction between the indicators determining variability in fertility.

8.3 MODELLING APPROACH

Many methods can be used in analysing fertility behaviour. However, as Fig 8.1 has indicated, there are many explanatory variables that potentially interact with one another in affecting fertility outcomes. For this reason a multivariate statistical modelling approach was selected for the present investigation.

The dependent variable used to measure fertility in this model is the number of children ever born (CEB) to each woman – in other words including all live births to each of the women included in the data set. Table 8.1 provides a summary of this measure and in particular of the apparent change in fertility

behaviour over time. In the table, CEB is grouped into two categories of 'small' and 'large' numbers of children (ranges of four or fewer children and five or more children respectively), cross-tabulated against two age categories (aged less than 45 and 45 or older). The differences in table cell values and in particular in the percentages suggest changes in the circumstances giving rise to the fertility behaviour of younger women compared to their older peers.

Table 8.1: CEB by respondent age group

	Old (over 45)		Young women (45 and less)	
Child category	Women	Percent	Women	Percent
1-4 Children	61	20.3	236	78.7
5 Children or more	239	79.7	64	21.3
Total	300	100.0	300	100.0

Given this focus on the effects of social change on women's overall fertility experiences, CEB is also a better measure of fertility than other time-specific measures, such as probability of birth within a given time period (e.g. within the last year). For example, using probability of giving birth in the year prior to the survey would have to take into account the fact that majority of younger respondents, who married relatively late, had a high probability of giving birth during the years immediately prior to the survey. Using CEB avoids this problem, and moreover was readily determined from the information obtained on both births and deaths and children's ages at the time of survey. For such reasons CEB is the choice of fertility variable used in the modelling investigations detailed below. However, this decision is also not to ignore the limitations of using CEB to measure fertility, most notably the fact that it may have been a fully complete measure for respondents in the sample who remained biologically capable of having further children. This limitation of using

CEB is re-visited in the conclusion of the chapter, in light of the modelling results.

Basic counts for CEB and the range of potential explanatory variables are presented in Table 8.2. Together this set of variables is consistent with the relations between fertility and socio-economic characteristics discussed earlier and summarised in the conceptual model presented in Figure 8.1 above. Using these variables, a series of different models was fitted using Ordinary Least Squares (OLS) regression to investigate the overall and net effects of different socio-economic variables on CEB. Sets of dummy variables were created for the potential predictor variables which are categorical in form; in other words including those variables measuring the following: education, occupation, income, place of residence, and place of birth. In contrast, age at first marriage, age difference, and desired number of children are continuous variables and in consequence could be used in their original form.

In addition to the frequency counts given in Table 8.2, correlations between pairings of socio-economic variables were also examined prior to modelling. Assessing these correlations was important since strongly correlated variables subsequently entered into the same multiple regression model may lead to misleading values for model coefficients – i.e. the problem known as (multi-) collinearity, whereby the effect of each independent variable on the response variable, net of other independents, may be obscured (Aiken et al, 1991).

Table 8.2: Frequency counts for model variables

Variable	Number women (N=600)
Desired number of children	
1-4 children	281
5 children & more	319
Respondent education	
Not university educated	478
University educated	122
Age at first marriage	
Less than 20	261
20-24	210
25-29	101
30-34	25
35-39	3
Age difference	600
Female occupation	
None	311
In paid work	289
Female occupation	
None (Never work)	311
Primary or Secondary sector	12
Tertiary sector	262
Not defined	15
Male occupation	
None (unemployed)	62
Primary or Secondary sector	108
Tertiary sector	332
Not defined	60
Retired	38
Net annual family income	
Less than 5000 Dinar	259
5000-10,000 D	309
More than 10,000 D	32
Total	600
Place of Birth	
Rural	288
Urban	312
Place of residence	
Rural	300
Urban	300

The pair wise correlations among the set of study variables are provided in Table 8.3. (These include the correlations between CEB and the potential explanatory variables.) Attention can first be turned to a range of strong negative correlations found to be statistically significant at the 99 per cent confidence level. These include correlations between CEB and the following variables: female level of education, respondents' age at marriage, age at first birth, and occupation (Pearson's R = -0.601, -0.536, -0.498, and -0.412 respectively). Correlations between each of the variables in this latter set of variables and desired children were very similar, in some cases identical to, those just reported (Pearson's R= -0.601, -0.526, -0.504, and -0.428 respectively). Similarly weaker negative correlations found between several other socio-economic variables and CEB were mirrored in the correlation of the former with the desired number of children.

The aforementioned correlations point in turn to the very strong correlation between CEB and desired number of children (R = 0.913). A range of other strong positive correlations, again statistically significant at the 99 per cent confidence level, are also evident, however. Of note is the correlation between respondents at first marriage and their age at first birth, which was stronger even than the correlation between CEB and desired children (R = 0.949).

Table 8.3: Correlation matrix for study variables

Correlations

		Total children	No of child like	Age of mother at first child	women age at first marriage	Level of education of wife	Wife Occupation	Husband Occupation	FIncomYr	Age Difference Husband and wife	Women birth place	Rural Urban
Total children	Pearson Correlation	1	.913**	-.498**	-.536**	-.601**	-.412**	.069	-.060	-.151**	-.108**	-.064
	Sig. (2-tailed)		.000	.000	.000	.000	.000	.093	.140	.000	.008	.118
	N	600	600	600	600	600	600	600	600	600	600	600
No of child like	Pearson Correlation	.913**	1	-.504**	-.526**	-.601**	-.428**	.077	-.049	-.129**	-.150**	-.127**
	Sig. (2-tailed)	.000		.000	.000	.000	.000	.061	.235	.002	.000	.002
	N	600	600	600	600	600	600	600	600	600	600	600
Age of mother at first child	Pearson Correlation	-.498**	-.504**	1	.949**	.587**	.452**	-.011	.127**	-.083*	.099*	.062
	Sig. (2-tailed)	.000	.000		.000	.000	.000	.785	.002	.043	.016	.131
	N	600	600	600	600	600	600	600	600	600	600	600
women age at first marriage	Pearson Correlation	-.536**	-.526**	.949**	1	.629**	.487**	-.036	.123**	-.082*	.093*	.050
	Sig. (2-tailed)	.000	.000	.000		.000	.000	.376	.002	.044	.022	.225
	N	600	600	600	600	600	600	600	600	600	600	600
Level of education of wife	Pearson Correlation	-.601**	-.601**	.587**	.629**	1	.710**	-.060	.242**	.176**	.194**	.115**
	Sig. (2-tailed)	.000	.000	.000	.000		.000	.140	.000	.000	.000	.005
	N	600	600	600	600	600	600	600	600	600	600	600
Wife Occupation	Pearson Correlation	-.412**	-.428**	.452**	.487**	.710**	1	-.019	.238**	.154**	.165**	.106**
	Sig. (2-tailed)	.000	.000	.000	.000	.000		.648	.000	.000	.000	.010
	N	600	600	600	600	600	600	600	600	600	600	600
Husband Occupation	Pearson Correlation	.069	.077	-.011	-.036	-.060	-.019	1	.088*	.060	-.007	.035
	Sig. (2-tailed)	.093	.061	.785	.376	.140	.648		.031	.144	.860	.396
	N	600	600	600	600	600	600	600	600	600	600	600
FIncomYr	Pearson Correlation	-.060	-.049	.127**	.123**	.242**	.238**	.088*	1	.049	.000	-.014
	Sig. (2-tailed)	.140	.235	.002	.002	.000	.000	.031		.235	.996	.728
	N	600	600	600	600	600	600	600	600	600	600	600
Age Difference Husband and wife	Pearson Correlation	-.151**	-.129**	-.083*	-.082*	.176**	.154**	.060	.049	1	.061	.022
	Sig. (2-tailed)	.000	.002	.043	.044	.000	.000	.144	.235		.133	.589
	N	600	600	600	600	600	600	600	600	600	600	600
Women birth place	Pearson Correlation	-.108**	-.150**	.099*	.093*	.194**	.165**	-.007	.000	.061	1	.634**
	Sig. (2-tailed)	.008	.000	.016	.022	.000	.000	.860	.996	.133		.000
	N	600	600	600	600	600	600	600	600	600	600	600
Rural Urban	Pearson Correlation	-.064	-.127**	.062	.050	.115**	.106**	.035	-.014	.022	.634**	1
	Sig. (2-tailed)	.118	.002	.131	.225	.005	.010	.396	.728	.589	.000	
	N	600	600	600	600	600	600	600	600	600	600	600

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Furthermore, it can also be seen that education level is strongly associated with occupation (R = 0.710), as well as with age at marriage (R = 0.629) and age at first birth (R = 0.587); somewhat weaker correlations were found between occupation and age at marriage and occupation and age at the birth of the first child (R = 0.487 and 0.452 respectively). Overall however these patterns of correlations point to the relationships between respondent's

educations, the age at which they entered marital union and began their families, and their ideas regarding family size. The very strong association between age at marriage and age at first birth indicates that it is not only respondents who married young who had the first birth soon after their marriage. Survey data also shows that those who married later similarly became pregnant very soon after marriage, possibly relating to their heightened awareness of their more limited reproductive life span, and the age-related increase in risks associated with later pregnancy. Exploring the strongest correlated variables could explain why some variables should be omitted from the main models due to the effect of collinearity.

As noted earlier, strong correlations between potential explanatory variables pose a problem for statistical model building. To elaborate, there are three potential problems: i) not only that it becomes difficult to distinguish the individual impact of each independent variable, but also ii) collinearity may increase the standard errors of the coefficients the regression produces, while iii) collinearity also limits the size of R (Aiken et al, 1991). While these effects may be mitigated in differing ways, the approach taken here was relatively simple, and involved omitting from each of the main statistical models which were constructed one variable from each aforementioned pairing exhibiting high positive or high negative value for the Pearson's r correlation coefficient.

8.4 FITTED MODELS

A number of regression models of CEB were developed to explore the effect of differing socio-economic characteristics on fertility, and reporting these models forms the main focus of this section. The models include several of the potential explanatory variables introduced above, although to avoid collinearity problems the decision was also taken to omit three variables from the main modelling work. These omitted variables are first discussed, before turning to the main model results.

8.4.1 Effect of variables omitted from main models (occupation, desired children, age at first birth) on CEB

Based on the pattern of strong correlations shown in Table 8.3 the decision was taken to omit the variable measuring the respondents' occupation, and secondly, desired number of children, and thirdly the variable recording their age at which they first gave birth. As Table 8.3 shows, these variables exhibit strong correlations with several of the other potential explanatory variables. Excluding these three variables was in effect a means towards preserving the utility of the remaining set of variables in the main modelling work carried out.

However, seeking to avoid collinearity difficulties also has to be weighed against the strong correlations evidence those omitted variables and the dependent variable, CEB. The square of these correlation values provides an indication of how accurate any regression predictions of CEB made from these

variables would be, were simple linear regression models to be developed of CEB using either variable in turn as the predictor variable. These squared values here termed R Square values are considered further below.

Table 8.4, 8.5 and 8.6 below provide a summary of women's occupation as a significant factor in their experience of fertility. For the reason of the high correlation between female occupation and the level of education (R 0.710**), it is useful to examine the effect of female occupation directly with CEB to avoid hiding the significance of occupation in the model.

Table 8.4 shows a remarkable picture of the impact of female occupation on children ever born. It can be seen that females who were not in paid work had a high number of children (311 of 600 women had about 7 children), while females who were in paid work had about 4 children).

Table 8.4: The impact of employment on CEB (Mean)

Occupation Category	No	Mean
None	311	6.91
primary, tertiary, Not defined sector	289	4.07
Total	600	5.54

The impact of female occupation according to economic sectors (See appendix B) shows (Table 8.5) women not in paid work experienced a higher rate of childbirth: some 224 of 311 of those not in paid work had over 5 children (about 72.0 %). On the other hand, women in paid work gave birth to a small number of children (1-4 children). Some 83.3% of those in the primary and secondary sectors and 73.7% of those in tertiary sector had 4 and less children.

Table 8.5: The effect of female occupations according to economic sectors on CEB

			Total Number of children Hab		
			1-4 Child	5 & over	Total
Wife Occupation	None	Count	87	224	311
		% within Wife OccupationCorrected	28.0%	72.0%	100.0%
	Primary and Secondary	Count	10	2	12
		% within Wife OccupationCorrected	83.3%	16.7%	100.0%
	Tertiary	Count	193	69	262
		% within Wife OccupationCorrected	73.7%	26.3%	100.0%
	Not defined	Count	7	8	15
		% within Wife OccupationCorrected	46.7%	53.3%	100.0%
Total		Count	297	303	600
		% within Wife OccupationCorrected	49.5%	50.5%	100.0%

Unarguably, occupation has a significant effect on female fertility behaviour (Table 8.5); unemployed females had a large number of children (72%), while employed females had a low number of children (4 and less).

The impact of female occupation on CEB is explained clearly by linear regression. Table 8.6 presents a significant negative influence of female occupation on children ever born; P>001 at the 99% level of confidence and it explains 19% of the variability in CEB. (Note that the correlation reported in this table [Pearson's R = 0.436] is higher than that reported in Table 8.3 [there R = 0.412]. This difference can be attributed to the effect of creating dummies for occupation sectors in this model).

The B coefficient shows the negative effect of female occupation on CEB. For every one unit increase in each of these sectors, we expect a decrease (-3.240), (-2.884), (-1.707) respectively in CEB. All explanatory variables are significant at the 99% level of confidence P>.001.

Table 8.6: The effect of female occupation on CEB

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.436[a]	.190	.186	2.965

a. Predictors: (Constant), Dummy Wife occupation Not defined , Dummy Wife occupation Primary Secondary , Dummy Wife occupation Tertiary

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1227.815	3	409.272	46.540	.000[a]
	Residual	5241.225	596	8.794		
	Total	6469.040	599			

a. Predictors: (Constant), Dummy Wife occupation Not defined , Dummy Wife occupation Primary Secondary , Dummy Wife occupation Tertiary

b. Dependent Variable: Total childrenCorr

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	6.907	.168		41.073	.000
	Dummy Wife occupation Primary Secondary	-3.240	.872	-.138	-3.714	.000
	Dummy Wife occupation Tertiary	-2.884	.249	-.436	-11.597	.000
	Dummy Wife occupation Not defined	-1.707	.784	-.081	-2.177	.030

a. Dependent Variable: Total childrenCorr

Accordingly, the significance of female occupation will be involved in the conclusions of this chapter as a significant predictor of fertility.

It is also argued that husband's occupation affects fertility behaviour. In Libyan society men are responsible for all the external economic requirements of the family. This has begun to change in the past few decades particular among the younger generation where there is a partnership between the spouses in relation to household affairs. The husband's occupation remains potentially a significant factor in fertility behaviour. In this context, an empirical test has done regarding the effect of husband's occupation on fertility in El Gebel El Akhdar. Table 8.7 shows that husband's occupation affects the CEB; where the

husband is not in paid work women had about 7 children, while those whose husband was in paid work had about 5 children.

Table 8.7: The impact of husband occupation on CEB (Mean)

Occupation Category	No	Mean
None, Retired	100	7.05
primary, tertiary, Not defined sector	500	5.24
Total	600	5.54

Table 8.8 indicates that women whose husband worked in the tertiary sector had smaller families (56.0%, (1-4 children)) while those whose husband had no work or were retired had more 5 children (53.2% had 5 and more).

Table 8.8: The influence of husband's occupation by economic sectors on CEB

			Total Number of children Hab		
			1-4 Child	5 & over	Total
Husband Occupation	None	Count	29	33	62
		% within Husband OccupationCorrected	46.8%	53.2%	100.0%
	Primary and Secondary	Count	50	58	108
		% within Husband OccupationCorrected	46.3%	53.7%	100.0%
	Tertiary	Count	186	146	332
		% within Husband OccupationCorrected	56.0%	44.0%	100.0%
	Not defined	Count	29	31	60
		% within Husband OccupationCorrected	48.3%	51.7%	100.0%
	Retired	Count	3	35	38
		% within Husband OccupationCorrected	7.9%	92.1%	100.0%
Total		Count	297	303	600
		% within Husband OccupationCorrected	49.5%	50.5%	100.0%

Although, husband's occupation illustrated effect on CEB, it would not include in model due to the main focus here is on female occupation so, the above indication is sufficient indicator of the effect of husband's occupation on CEB.

A second variable recording the respondent's desired number of children has been omitted from the main modelling work. Table 8.9 provides a summary of a model using desired number of children stated by respondents to predict the number of children the respondents actually had. The model was fitted using OLS regression. The high value for R Square (0.834) for this model suggests how well desired children predict CEB. Similarly, the parameter value for the predictor variable (1.146) suggests an almost perfectly linear (positive) relationship between respondents' actual and desired number of children. It should be noted however that there is no necessary relationship between the magnitude of R-square and the parameter value.

Table 8.9: Effect of desired number of children on CEB

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.913[a]	.834	.834	1.340

a. Predictors: (Constant), No of child like Correct

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	5395.045	1	5395.045	3003.958	.000[a]
	Residual	1073.995	598	1.796		
	Total	6469.040	599			

a. Predictors: (Constant), No of child like Correct

b. Dependent Variable: Total childrenCorr

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-1.422	.138		-10.280	.000
	No of child like	1.146	.021	.913	54.808	.000

a. Dependent Variable: Total childrenCorr

Elaborating this relationship a little further, Table 8.10 indicates that there is a large difference between older and younger generations according to the desired number of children. Some 246 of the 300 older women aged over 45 (about 82 per cent) desired more than five children (in previous decades a fertility rate of five children per women was considered as a means to demarcate less developed countries and regions; see Guengant, 1995). On the other hand 227 of the younger women (76 per cent) in the sample said that they did not want to have more than 4 children. The implication from this is that there has been an important change in fertility behaviour; the question of importance here is the extent to which and this variation can be attributed to other socio-economic factors under consideration.

Table 8.10: Desired number of children by respondent age group

Child category	Old (over 45)		Young (45 and less)	
	Women	Percent	Women	Percent
1-4 children	54	18.0	227	75.7
5& over children	246	82.0	73	24.3
Total	300	100.0	300	100.0

The variable recording the respondent's age at the birth of their first child was the third variable omitted from the main modelling work. Moreover, in contrast to the relationship between desired children and CEB, age at first birth exhibits a strong negative correlation with CEB. The results from fitting a model containing only the respondents' age at first birth are shown in Table 8.11. The fitted model is statistically significant, with R-square = 0.246 suggesting that using age at first birth to predict CEB accounts is less accurate than predictions

using desired number of children. As expected the value for the coefficient is negative (B=-0.350), indicating that the overall number of children born to respondent decreases depending on their age at the time of the birth of their first child. Specifically the coefficient suggests that a year's increase in a respondent's age at first birth results in a decrease by one-third in the overall number of children they have.

Table 8.11: Effect of age at first birth on CEB

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.498[a]	.248	.246	2.853

a. Predictors: (Constant), Age of mother at first child

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1601.646	1	1601.646	196.776	.000[a]
	Residual	4867.394	598	8.139		
	Total	6469.040	599			

a. Predictors: (Constant), Age of mother at first child

b. Dependent Variable: Total childrenCorr

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	13.338	.568		23.483	.000
	Age of mother at first child	-.350	.025	-.498	-14.028	.000

a. Dependent Variable: Total childrenCorr

From these three initial models, it can be concluded firstly that female's occupation has significant impact on CEB as well as the desired number of children has a significant effect on actual on fertility as measured by CEB. In addition, respondents' age at the birth of their first child also has an influence on fertility behaviour. Overall then, these models confirm that although these variables are excluded from the main models, it is important not to totally

discount their effect. Accordingly, attention returns to them in the concluding section for this chapter.

8.4.2 Main model 1 - Effect of age at first marriage on CEB

The first of the main models in the present chapter was developed to further explore CEB as a function of the respondents' age at first marriage. To recap, modelling investigations in the preceding chapter demonstrated that respondents' education levels and occupation have a significant effect on marriage age, and that the importance of this effect comes from the function of marriage on reducing fertility rate. Table 8.12 below shows the variations in number of births by respondents' age at first marriage and illustrates quite clearer the tendency of those who married young, specifically aged less than 20 years old, to have larger numbers of children (five or over). Nearly four-fifths of the total 261 women who were married before their twentieth birthday had such large numbers of children. In contrast, a tendency for smaller numbers of children is equally evident among women marrying even just a few years older in their early twenties, with 61 per cent of the 210 respondents in this group (20-24) having had between 1 and 4 children and less than 40 per cent having five or more children. Similarly over 82 per cent of respondents who had married aged between 25-29, and all those who married older than this, had between one and four children.

Table 8.12: Respondents' age at first marriage by CEB

			Total Number of children Hab		
			1-4 Child	5 &over child	Total
Female age at first marriage Reclassified	Lowest-19	Count	58	203	261
		% within Female age at first marriage Reclassified	22.2%	77.8%	100.0%
	20-24	Count	129	81	210
		% within Female age at first marriage Reclassified	61.4%	38.6%	100.0%
	25-29	Count	83	18	101
		% within Female age at first marriage Reclassified	82.2%	17.8%	100.0%
	30-34	Count	25	0	25
		% within Female age at first marriage Reclassified	100.0%	.0%	100.0%
	35-39	Count	2	1	3
		% within Female age at first marriage Reclassified	66.7%	33.3%	100.0%
Total		Count	297	303	600
		% within Female age at first marriage Reclassified	49.5%	50.5%	100.0%

Such breakdowns indicate that differences in CEB can be modelled using age at first marriage as a predictor. Fitting this model yielded an R-Square value of 0.29, with the model proving to be statistically significant. Comparison against Table 7.11 shows this value to be similar to the R-Square value obtained for the model using age at first birth to predict CEB. Furthermore the value of R-Square -0.286 for the predictor variable (Table 8.13) indicates that increased age at first marriage has a downwards effect on the number of CEB comparable to the effect found for earlier model of age at first birth.

Table 8.13: Effect of age at first marriage on CEB

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.536[a]	.287	.286	2.777

a. Predictors: (Constant), women age at first marriage

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1857.140	1	1857.140	240.805	.000[a]
	Residual	4611.900	598	7.712		
	Total	6469.040	599			

a. Predictors: (Constant), women age at first marriage

b. Dependent Variable: Total childrenCorr

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	13.520	.527		25.674	.000
	women age at first marriage	-.385	.025	-.536	-15.518	.000

a. Dependent Variable: Total childrenCorr

8.4.3 Main model 2 - Effects of female education

Model 1 was subsequently expanded to investigate the effect of respondents' education on CEB. Education is often thought to be a principal explanation of the timing of fertility transition and therefore its impacts on fertility are important to explore within the present study context. However, the nature of the relationship is a complex one, and how one measures education has a major impact on one's findings.

Table 8.14 illustrates in summary form the relationships between respondents' education levels and CEB. It indicates that women who never attended school had, on average, the largest number of children (eight), while females who attended primary and elementary levels had approximately 6.4 and 5.5 children respectively. Those who obtained institute, secondary, and university education

had fewer than five children, with university graduates on average having as few as 2.8 children. The effect of female education on fertility may be attributed to the educated female's greater knowledge of family planning and their concern about the cost of having children.

Table 8.14: Mean numbers of CEB by respondents' education levels

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
None (no schooling	181	8.00	2.716	.202	7.60	8.40	1	12
Primary school	75	6.40	3.009	.347	5.71	7.09	1	12
Elementary school	87	5.55	3.241	.348	4.86	6.24	1	12
Intermediate Institue	106	4.63	2.642	.257	4.12	5.14	1	10
Secondary school	29	2.86	2.048	.380	2.08	3.64	1	10
Univ ersity and College	122	2.78	1.679	.152	2.48	3.08	1	10
Total	600	5.54	3.286	.134	5.28	5.80	1	12

Including education level as a variable in a regression context enables its effect on CEB to be assessed while holding constant the effect of age at first marriage. The model output, in Table 8.15 below, indicates firstly that the inclusion of the education raises the accuracy of the model to slightly over forty per cent; moreover the model is statistically significant. The values for each coefficient indicate that the significant negative effects of the explanatory variables on CEB. The output shows that some of the negative effect which was attributed to respondents' age at first marriage in Model 1 in fact owes to the negative impact of respondent's education. The parameter values shown are measured relative to uneducated women who form the reference group for the model. In general it can be seen that the negative effect of education on the number of CEB increases by level of education, and is greatest among women with experience of education beyond institute level. Interestingly the effect appears greatest for women educated at secondary level, rather than among

those in receipt of university-level education. In other words women educated at post- institute level, and in particular at secondary level, have fewer CEB than women receiving less or no education.

Table 8.15: Effect of education and age marriage on CEB

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.642[a]	.413	.408	2.529

a. Predictors: (Constant), Dummy5Univers, Dummy4Secon, Dummy3Instit, Dummy2PrElm, women age at first marriage

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2669.715	5	533.943	83.479	.000[a]
	Residual	3799.325	594	6.396		
	Total	6469.040	599			

a. Predictors: (Constant), Dummy5Univers, Dummy4Secon, Dummy3Instit, Dummy2PrElm, women age at first marriage

b. Dependent Variable: Total childrenCorr

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	11.686	.552		21.161	.000
	women age at first marriage	-.210	.030	-.291	-7.099	.000
	Dummy2PrElm	-1.619	.280	-.219	-5.776	.000
	Dummy3Instit	-2.509	.332	-.291	-7.555	.000
	Dummy4Secon	-4.416	.516	-.288	-8.559	.000
	Dummy5Univers	-3.507	.382	-.430	-9.178	.000

a. Dependent Variable: Total childrenCorr

8.4.4 Main model 3 - Effects of income and partner age differences

Model 3 was fitted to enable the impact of multiple socio-economic variables on CEB to be investigated. Specifically Model 2 was extended to include the following range of measures: income, and partner age differences.

A cross-tabulation of family income and CEB (Table 8.16) indicates the relationship between them. The majority (57 per cent) of respondents with over five children had annual incomes less than 5000 Dinar whereas those with family incomes higher than this, between 5000 and 10,000 Dinar, and over 10,000 Dinar, tended to have smaller families of between 1 and 4 children (55 per cent of those with a family income of 5000-10,000 Dinar and 53.1 per cent of those with a family income over 10,000 Dinar. It could be said, there is negative relation between income and CEB; with the increase of income, there is decrease in CEB.

Table 8.16: The effect of family income per year on children ever born

			Total Number of children Hab		
			1-4 Child	5 & over	Total
Family Income	less than 5000 Dinar	Count	111	148	259
		% within FIncomYr Corrected	42.9%	57.1%	100.0%
	5000-10,000 D	Count	169	140	309
		% within FIncomYr Corrected	54.7%	45.3%	100.0%
	More than 10,000 D	Count	17	15	32
		% within FIncomYr Corrected	53.1%	46.9%	100.0%
Total		Count	297	303	600
		% within FIncomYr Corrected	49.5%	50.5%	100.0%

*(Libyan Dinar equal to about 50 Pence in UK)

Table 8.17 contains the output of the third regression model, Model 3, including the variables just discussed. The addition of these models increases the accuracy of the model, but only slightly (R-Square = 0.420).

The Table of coefficients indicates that all levels of education had significant negative effects on CEB at 99% level of significance (P>.001). Also, age at first marriage illustrated a significant negative influence on fertility P>.001. Age difference between husband and wife had a negative impact on CEB. Family income also seems to be a significant predictor of CEB. The combination of these variables hides the significance of some variables such as income somewhat.

Table 8.17: Model 3 Effect of marriage, education, income, age difference on CEB

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.654[a]	.427	.420	2.504

a.

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2764.544	8	345.568	55.130	.000[a]
	Residual	3704.496	591	6.268		
	Total	6469.040	599			

a.

b. Dependent Variable: Total childrenCorr

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	12.131	.610		19.888	.000
	women age at first marriage	-.224	.030	-.312	-7.464	.000
	Dummy2PrElm	-1.413	.285	-.191	-4.949	.000
	Dummy3Instit	-2.313	.351	-.269	-6.580	.000
	Dummy4Secon	-4.088	.526	-.267	-7.771	.000
	Dummy5Univers	-3.390	.399	-.415	-8.489	.000
	Age Difference Husband and wife	-.102	.035	-.096	-2.885	.004
	Dummy Family Income 5-10	.245	.222	.037	1.106	.269
	Dummy Family Income More 10,000	1.271	.477	.087	2.667	.008

a. Dependent Variable: Total childrenCorr

8.4.5 Main model 4 – Locational effects on CEB

Finally introduced into the last of the main models are locational variables: namely variables recording respondents' place(s) of birth and current residence at the time of the survey. Both locational variables were simple binary variables categorising locations as being either urban or rural. Their inclusion in the main models enables an assessment of the effect of location type on CEB, holding constant the impacts socio-economic variables have on the latter.

In particular, it may be hypothesised that those born in rural areas are likely to have a higher number of children than those born in urban areas. The cross-tabulation in Table 8.18 indicates those who were rural-born reported larger numbers of children 56.6% (over five), while urban-born people had fewer children (55.4%, 4 and less).

Table 8.18: The impact of Place of birth on child ever born

			Total Number of children Hab		
			1-4 Child	5 & over	Total
Women birth place	rural	Count	124	164	288
		% within Women birth place	43.1%	56.9%	100.0%
	urban	Count	173	139	312
		% within Women birth place	55.4%	44.6%	100.0%
Total		Count	297	303	600
		% within Women birth place	49.5%	50.5%	100.0%

Place of current residence is also an important socio-economic variables explaining fertility variations. Table 8.19 illustrates that rural residence was associated with having more children.

Table 8.19: The impact of place of residence on CEB

			Total Number of children Hab		
			1-4 Child	Over 5 Child	Total
Rural Urban	Rural	Count	139	161	300
		% within Rural Urban	46.3%	53.7%	100.0%
	Urban	Count	158	142	300
		% within Rural Urban	52.7%	47.3%	100.0%
Total		Count	297	303	600
		% within Rural Urban	49.5%	50.5%	100.0%

An important consideration here is the existence of collinearity between the two location variables, indicated by the strong correlation between the latter two variables shown in Table 8.3 earlier in this chapter. To avoid the problems this may lead to within the modelling context two versions of Model 4 were created. In the first version of the model the variable recording place of birth was added, while place of current residence was omitted. Vice versa in the second version of the model, only the place of residence variable was added, while the information on respondents' birth places was left out.

The output for the first version of Model 4 is provided in Table 8.20. The fitted model suggests that where a respondent is born whether in a rural or urban area has negligible impact on CEB. Adding this variable to the model does not appear to help explain the variability in the number of children ever born. The reason may attribute to the massive spread of education across the country including urban and rural areas.

Table 8.20: Effect of place of birth

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.654[a]	.427	.419	2.506

a.

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2764.603	9	307.178	48.924	.000
	Residual	3704.437	590	6.279		
	Total	6469.040	599			

b. Dependent Variable: Total childrenCorr

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	12.120	.620		19.557	.000
	women age at first marriage	-.224	.030	-.312	-7.449	.000
	Dummy2PrElm	-1.416	.287	-.191	-4.925	.000
	Dummy3Instit	-2.317	.354	-.269	-6.543	.000
	Dummy4Secon	-4.093	.529	-.267	-7.743	.000
	Dummy5Univers	-3.397	.406	-.416	-8.358	.000
	Age Difference Husband and wife	-.102	.035	-.096	-2.884	.004
	Dummy Family Income 5-10	.247	.223	.038	1.109	.268
	Dummy Family Income More 10,000	1.270	.477	.087	2.663	.008
	Dummy Place of Birth Urban	.020	.210	.003	.097	.923

a. Dependent Variable: Total childrenCorr

The second version of Model 4 which was fitted - adding place of residence, but not place of birth is described in Table 8.21.

Table 8.21: Effect of place of residence

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.654[a]	.427	.419	2.506

a.

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2764.657	9	307.184	48.925	.000
	Residual	3704.383	590	6.279		
	Total	6469.040	599			

b. Dependent Variable: Total childrenCorr

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	12.147	.623		19.501	.000
	women age at first marriage	-.224	.030	-.312	-7.457	.000
	Dummy2PrElm	-1.411	.286	-.191	-4.938	.000
	Dummy3Instit	-2.308	.354	-.268	-6.525	.000
	Dummy4Secon	-4.087	.527	-.267	-7.761	.000
	Dummy5Univers	-3.382	.403	-.415	-8.392	.000
	Age Difference Husband and wife	-.102	.035	-.096	-2.884	.004
	Dummy Family Income 5-10	.242	.223	.037	1.088	.277
	Dummy Family Income More 10,000	1.271	.477	.087	2.665	.008
	Dummy Urban	-.028	.208	-.004	-.134	.893

a. Dependent Variable: Total childrenCorr

All the variables from Model 3 are also contained in Model 4 (both versions) with little signs of changes in either the magnitude or significance of the coefficients for these variables. Similarly, the degree of variance (with 42 per cent) in CEB explained remains very similar to Model 3. Adding the dummy locational variables for respectively place of birth (urban or otherwise) and place of current residence (again urban or otherwise) does not appear to increase degree of variance in CEB explained by the model; neither of these variables attains statistical significance.

Consequently, a main finding that may be drawn from fitting these models is the negligible effect location appears to have on current fertility behaviour in El Gebel El Akhdar. Holding constant the effects of other socio-economic

characteristics, location of birth and location of current residence of the respondents do not appear to help explain the variability in the number of children ever born. These are important findings given that different processes, norms and conditions may be held to operate in non-urban areas compared to urban areas. Instead, Model 4 tends to confirm that level of education, age differences and major differences in family income are the most important factors accounting for the differences in fertility which are manifest in the differences in the number of CEB.

8.5 CONCLUSION

The analysis in this chapter has extended the analysis of variations in fertility among the sample of respondents and the both direct and indirect effects of education on fertility. Core to this part of the analysis are a series of multiple linear regression models. The measure of children ever born for all women included in the survey was argued to be an appropriate way to include fertility as the response variable in the models which have been created. The average numbers of CEB among married women of reproductive age (15-45) was 3.6 children; while it was 7.5 children among married women aged over 45. Several demographic, socio-economic variables were correlated with children ever born. Regarding female education levels, highly educated women (university level) have less than half the CEB that illiterate women do. Furthermore, employed females had a smaller number of children than those not in paid work. Similarly, those women who had less knowledge about family planning methods

had significantly larger families than those who had a higher level of knowledge about family planning.

Models drew on data for all respondents and were fitted in four main stages in order to allow the effects of different socio-economic variables on CEB to be established. Prior to modelling, high correlations among some variables were highlighted, as were potential problems of collinearity. To avoid these problems a number of variables were omitted from the main modelling work. Some of these omitted variables, in particular occupation, desired number of children, also had strong correlations with CEB.

A key finding from this analysis is that education, when measured directly, has a significantly negative effect on fertility. In other words, with an increase of education levels a decrease of CEB is observed. Also, age at first marriage had a significantly negative impact on fertility. Socio economic status (family income per year) had a significant influence on fertility too. And separate analysis of income indicated a negative influence of income on CEB. Also, there is a negative influence of partner's age difference on CEB (Figure 8.2).

Furthermore, holding constant the characteristics just referred, location of birth and location of current residence of the respondents do not appear to help explain the variability in the number of children ever born.

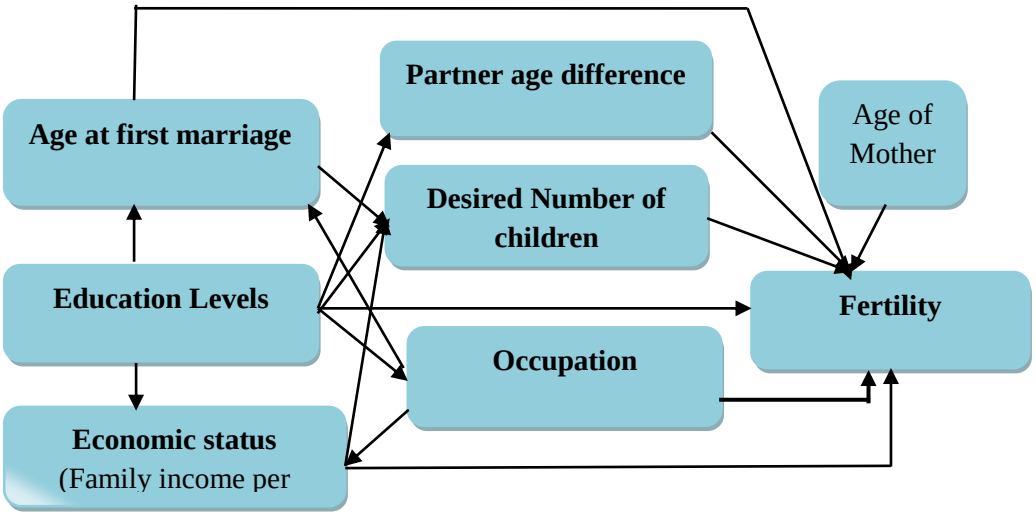


Figure 8-2: Revised conceptual schema showing key socio-economic effects on fertility as determined from multiple regression analysis

In other words, there appears no significant effect of where a respondent was born, or where they presently lived at the time of data collection, on their number of CEB. Collinearity problems associated with the correlation of place of birth with place of residence were avoided by fitting two different versions of the final model, Model 4. Both versions of this final model instead appear to confirm the influence of the spread of education on female reproductive behaviour – i.e. in so far as they point to convergence of education opportunities between respondents in different places.

Based on the analysis performed, the conceptual model presented at the outset of this chapter can be revised to highlight more clearly key relationships between education, other socio-economic factors and fertility which have been explored and which appear to account substantially towards understanding the fertility decline in the El Gebel El Akhdar region studied. The revised model reinforces the particular importance of the spread of education, not only in

increasing female knowledge about family planning and contraceptive use, but also its effects in terms of delaying age at first marriage and increasing the likelihood of manner contributing to the workforce.

Also, female occupation has significant effects (as shown in a separate analysis not reproduced here) but was excluded from the final statistical model due to the high collinearity between occupation and education levels. It is as a significant predictor of fertility whether for the wife or husband (employed women have lower fertility than unemployed females). These variables also interact with each other; educated women tend to have smaller numbers of children. Adversely, uneducated females desired large numbers of children. Also, education levels impacted on age at first marriage where those who spent a longer time in obtaining a higher education had smaller numbers of children.

9 CHAPTER NINE: SUMMARY AND CONCLUSIONS

9.1 INTRODUCTION

Reviewing the literature on demographic transition in less developed countries has shown that a majority of these countries are still undergoing fertility transition. This is particularly true in the case of Arab and African countries (ECA, 2001; PRB, 2008). 'Religion, cultural norms, and value systems of childbearing are highly resistant fertility determinants' (Offenhauer, 2005; Jejeebhoy et al., 2001). For example, cultural norms govern peoples' thoughts on the advantages of large families and high fertility as family prestige and security for old age (Basu, 1992; Hammel, 1990). Also, the effect of socio-economic conditions, especially education (female education), has played a significant role in demographic transition (Castro, 1995; Caldwell, 1980, Jejeebhoy, 1995, Jeffery and Basu, 1996).

The demographic transition in Arab and African countries came late, as described by Reher (2004). Those experiencing the onset of fertility decline after 1934 he termed latecomers (Fig 9.1). The term is especially relevant to those who entered the transition in the last three decades (Casterline, 1991; Cohen, 1993). They came later compared to European societies which took the lead in practising different methods of fertility control in 1830s. By contrast the onset of the fertility decline in most Africa and Arab countries occurred largely during the 1980s and 1990s (Garenne and Joseph, 2002). In Libya's case the country is still undergoing a transition.

a) B)

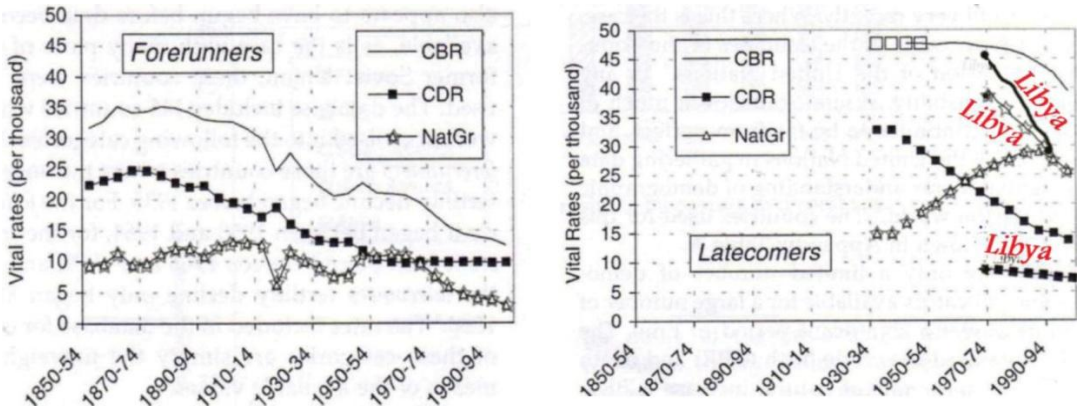


Figure 9-1: Demographic transition in a) Forerunners and b) latecomers (adapted from Reher (2004) by the author to include Libya)

In the context of this thesis, understanding the late fertility transition of Libya became the chief overall goal of the author. In particular he was interested to see whether specific socio-economic circumstances (especially the effect of formal female education on fertility behaviour in El Gebel El Akhdar) could be shown to be responsible for driving this important social change.

This study has not only examined fertility transition in El Gebel El Akhdar from 1970 onwards, but it has also viewed the historical context tracing events as far back as the 1930s and 1940s. The study included interviews with women of varying ages, but with some whose fertility knowledge goes back as far as the 1930s. The study was organised around researching five specific objectives. We commence this final chapter by considering what has been found in relation to each one, before turning to consider the wider theoretical and policy contributions of the research.

The specific objectives of the study:

The first target of the study was to examine the extent of fertility rate change, (using many techniques such as GFR, ASFR, TM, TFR, CBR, CEB, period and cohort fertility, and parity-specific fertility behaviour) in El Gebel El Akhdar [Chapter 5].

Objective two was to explain the spatial variations in fertility behaviour between rural and urban areas as well between older and younger cohorts. The reason for exploring spatial variations was to identify the potential determinants of such variations with a view to understanding the roles of scale and (spatial) context on fertility behaviour (Chapters 2 & 5).

The third objective was to examine the education transition in Libya including El Gebel El AKhdar, concentrating specifically on the evolution of female education and its impact on recent changes in the country's fertility rate [Chapter 4].

The fourth objective was to examine the effect of three of the proximate determinants on female reproductive behaviour and fertility transition according to Bongaarts' model (Chapter 6), paying particular attention to age at first marriage (chapter 7).

The fifth objective was to explain fertility changes measured in terms of children ever born in relation to underlying socio-economic circumstances (Chapter 8).

9.2 RESEARCH FINDINGS RELATIVE TO EACH OF FIVE OBJECTIVES

The findings of the research according to each of these objectives were:

9.2.1 Objective 1: Examination of fertility rate change

Objective one looked at the extent of fertility transition in El Gebel El Akhdar. The application of diverse methods of measuring fertility (chapter 5) indicated that fertility has experienced a tremendous decline in El Gebel El Akhdar. The Total fertility rate declined from 7.5 children per woman in 1978 to 4.9 in 2008 in the study area. The General fertility rate decreased from 289 per thousand women in 1978 to 117 in 2008. Total martial fertility also declined from 10.3 per women to 5.7 in 2008. The crude birth rate declined from 56 per thousand in 1973 to 24 in 2004. The gross reproduction ratio declined from 4.4 in 1973 to 2.2 in 2008.

These different empirical measures reported in Chapter 5 point to a very significant decline in fertility in El Gebel El Akhdar during the period under consideration. This is not due simply to structural demographic effects (that might be captured by the change in the CBR) but are also evident in cohort specific fertility measures such as the CFR which were shown to drop by more than 50% over the period 1978 to 2008.

It is clear that Libya has experienced substantial fertility change in recent years in the study area and bringing this finding to Reher (2004) theory shows that the transition in Libya came very late when compared with developed countries

which experienced the onset of fertility transition in the late of 19th century. Libya was also late in entering the transition compared with the less developed countries that experienced the onset of transition in the 1960s, such as in Asia and Latin America.

These findings may seem to be descriptive, but the thesis has gone further by using demographic methods to explore the issue analytically. For example, the research reported in chapter 5 shows that fertility decline, when it did arrive, was achieved mainly by a reduction in the total marital fertility rate. TMFR declined in the study area by more than 50% over the period from 1978 to 2008 and this mainly as a result of a rise in the age of marriage. This finding confirms the importance of Bongaart's (1982) findings both methodologically and theoretically. They illustrate the strengths of general demographic approaches in terms of their applicability to Libya, a context where such an approach has not previously been applied.

9.2.2 Objective 2: Explanation of spatial variation in fertility

Objective two looked at the spatial variations in fertility behaviour between rural and urban areas as well between older and younger cohorts (chapters 2 & 5). The evidence suggests an obvious influence of place on fertility in the 1970s and 1980s. Rural women were characterised as having more children than urban women. For example, in 1978 the TFR was higher in rural areas than urban areas; 8.5 in rural areas compared to 6.3 in urban areas. Also, GFR was 320 per thousand women in rural areas compared to 258 in urban areas. The

total martial fertility rate also was greater in rural areas than in urban ones. It was 10.6 in rural and 8.3 in urban settlements.

The spatial variation was explained by the differences in socio-economic circumstances at that time in rural and urban environments. In the decades that were to follow decision-makers sought to reduce place based differentials in terms of education (schools), health care centres etc, and by development programmes to improve standards of living, income and so on (Hamd, 2002). The results of these policies appeared to be, amongst other effects, the convergence in fertility rates between places. For example, fertility convergence between places was observed in 2008 with a TFR of 4.9 recorded in rural areas and 4.8 in urban areas, and a GFR of 117 in both areas. The TM was 5.4 in rural areas and 5.9 in urban area. It is obvious that there is a trend towards the disappearance of fertility variations in the study area (Chapter 5). Here, it should be emphasized that there is a need for more investigation of spatial models to uncover what reasons account for this convergence.

The survey finding indicates that the spatial analysis is still a matter of importance in fertility analysis (Wilson, 1984). The spatial version of fertility transition, as presented in Woods (1979) model of the spatio temporal model, would place Libya in stage t2 of the fertility transition. The metrics presented in the thesis indicate that there was a slight decline in fertility in most areas with significant change pronounced in some leading regions such as in north Libya where CBR declined to less than 20 per thousand women. Theorising the spatial convergence of fertility was harder than describing it in the thesis.

The value of the survey in this context arises from its powerful evidence of the need of spatial analysis methods in terms of identifying leading and lagging regions as well as exploring why spatial convergence took place. Woods (1979) ascribed great importance to the influence of 'modernisation' producing spatial change, whereas the survey conducted in Libya by the author suggested a more sophisticated account pointing to social and cultural rather than economic forces as being the most important ones shaping Libya's changing fertility landscape. This is not to say however that economic change powered by oil wealth was not of critical importance in underpinning the social and cultural changes that were taking place.

9.2.3 Objective 3: Examination of the education transition

The literature indicated that education is a key factor in fertility change (Caldwell, 1980; Andorka, 1982; Caldwell and Caldwell, 2001; Blake and Del Pinal, 1982; Jejeebhoy, 1995; Jeffery and Basu, 1996).

Chapter 4 revealed the scale of transition in Libya. Initially, the improvements in education attainment for women were shown to be vast. In El Gebel El Akhdar, for example, the percentage of university-educated females increased from 14 % in 1973 to 60% in 2006. Thereafter, having shown that education transition has taken place, the next contribution of the thesis was to examine how this impacted on fertility. Evidence from the study showed that there is an inverse association between fertility and education as follows: women with 'no schooling' had an average of 8.0 children, while those with 1 to 6 years of

education (primary) had average 6.4 children. By contrast those with 9 to 13 years of education (Institute) had 4.6 children, and with those 13 to 17 years of education (university and above), had only 2.8 children (Chapter 8, P 204).

Undoubtedly, education matters in different ways in terms of women with different levels of education. The inverse relationship between the increase of education levels and the decrease of fertility could be explained by the influence of the increase of female knowledge regarding family size, fertility issues, autonomy, female participation in work force and length of stay in the education programme.

Putting the aforementioned finding in context, involves returning to the ideas of Jeffery and Basu (1996). The thesis has added to their model by demonstrating how significant investments in education and in particular in higher education of females have been. It has been shown that education has had a profound influence in bringing about fertility behaviour-change, with a move towards small family sizes (it was demonstrated that women with higher education had 2.8 children and got married 8 years later than those with no education). This not only confirms Jeffery and Basu's (1996) idea of the influence of schooling on various variables that eventually effect fertility outcomes such as effect of female schooling (particular higher education) on marriage age, employment and so forth, but it shows just how powerful such an effect can be within an Islamic society in which gender inequalities in other realms may appear very great by contrast with in Western Europe. Other researchers might explore this issue further in the Arab world.

9.2.4 Objective 4: Intermediate variables:

Age at first marriage

In terms of the impact of biological factors on fertility behaviour, age at first marriage was shown to be a significant determinant of fertility. In the survey comparisons were made between the different generations (chapter 6). The survey showed that the age of first marriage increased from 18 in the older cohort (45+) to 23 years in the younger cohort (45 and less).

The evidence of the bivariate and multivariate analysis was that females with 6-9 years of education got married two years later than uneducated-women, and those with 10-13 years of schooling married four years later than women with no schooling. Those who were university educated married on average eight years later (chapter 7). It was also evident that husband's education was significant. Females who married men with high qualifications did so six years later than women whose husbands were not educated.

Education was also correlated with occupation. Employed women married five years later than unemployed females. As female engagement in the labour market advances, it can be anticipated that there will be further delays in the age at first marriage and a reduction in the amount of time women spend in sexual unions during their reproductive lifetimes.

This is in line with Bongaarts' (1982) model of the significant function of marriage on fertility change; also the thesis adds value to the model by showing how significant socio-economic factors such as education and

employment have influence on biological factors and eventually on fertility transition. This is not only in line with Bongaarts' (1982) model, but also confirms to some extent what Sheela and Audiarayana (2000) postulate on the determinants of age at first marriage. In this thesis the contribution to the literature has been to demonstrate from the researcher's survey that not all variables found in other countries to be key determinants of fertility are of the same importance. The thesis has argued that these differences may reflect the specificities of the researcher's methods, but they could be because of the influence of Islamic culture in affecting the role of women in society in a distinctive fashion. Once again this points to the need for further research.

These findings address the question of how socio-economic characteristics influence on the age at first marriage as one of the most important proximate determinants of fertility (objective 4).

Breastfeeding, abstinence, and contraceptive use

Examination of the effect of biological factors on fertility has shown that post-partum amenorrhoea was a significant factor controlling fertility. There was a substantial relationship between cohorts (old & young), the level of education and the duration of breastfeeding. The majority of older women (typically with little or no schooling) had breastfed for more than 12 months. On the other hand, younger educated females tended to breastfeed for 3-6 months.

No significant difference was noted in breastfeeding behaviour in urban and rural areas. It appeared that the effect of age on the period of breastfeeding indicated that the majority of lactating women were in the age group (15-19) in

both urban and rural areas. Those who married early (15-19) were also more likely to practise long-term breastfeeding (12-24 months).

Contraceptive use was one of the fertility-inhibiting factors, identified by Bongaarts (1982). Many different methods of contraception were practised in the study area. Contraceptive pills were the most common method followed by the use of condoms.

The research pointed to greater access to education and an increase in health awareness as well as the availability of better medical services as the main drivers behind the widespread use of contraceptives.

Therefore, the thesis has examined in detail three of the proximate determinants of fertility. In addition, it has illustrated the power of biological factors on fertility at the time of the author's 2008 survey. This is in line with Bongaart's (1982) theorisation of how the proximate determinants change in importance over time (chapter 2). The thesis adds value to this model by showing how significant female education has been in bringing about this change.

9.2.5 Objective 5: Explanation of the impact of socio-economic factors on children ever born (CEB)

In the context of examination of CEB, a series of multiple linear regression models were implemented. Models drew on data from all respondents and were

fitted in four main models in order to allow the effect of different socio-economic variables on CEB to be established.

The outcome of examining the effect of socio-economic factors on children ever born has been to show that there is a difference in fertility behaviour according to age cohorts (old & young). The average number of CEB for older cohorts [45+] who were characterized by high levels of illiteracy and low levels of engagement in the labour force was reported as 7.5 children, while the average number of births among younger cohorts [45 and less] (typically with better education and a later age of marriage) was 3.6 children. Also, younger generations tended to be in favour of smaller family size.

The results of bivariate and multivariate statistical models measuring the impact of socio-economic factors on fertility revealed that education was once again inversely correlated with fertility. The economic status measured in terms of family income per year showed the expected inverse association with fertility. In addition, there was a negative influence of the partner's age difference on CEB. The desired number of children had a very strong correlation with CEB. Female occupation also had a significant effect on CEB where employed women had lower fertility (4 children) than unemployed females (8 children).

To summarize the aforementioned, several demographic, socio-economic variables were correlated with CEB. Highly educated females (university level) were shown to have less than half the CEB of their illiterate counterparts. In addition, measuring the influence of employment on the number of children

showed that employed females had fewer children than those who were not in paid work. Age at first marriage had a significant negative impact on CEB. Income and partner's age difference operated negatively with CEB (Figure 8.2), while location of birth and residence did not help to explain the variability in CEB.

The revised model reinforces the importance of the spread of education not only in increasing female knowledge about family planning but for influencing the delay of age at first marriage and increasing likelihood of women contributing to the work force.

This is in line with Compton and Coward's (1989) model of the influence of socio-economic factors (particularly education and occupation) on female knowledge and attitudes toward contraceptive use, family planning, increasing of marriage age, and post-partum infecundability and eventually on fertility. In addition, it is also in line with Jeffery and Basu's (1996) idea of the specific effect of female schooling on other socio-economic factors such as occupation, age at first marriage, family planning and proximate determinants and ultimately on fertility as indicated in chapter 6, 7 and 8.

This is the first time that research of this kind has been conducted in Libya. The thesis goes beyond offering a descriptive account of demographic change and, as the statistical models have demonstrated in relation to the socio-economic determinant affecting the number of children ever born, sought to offer an analytic framework for advancing population research into fertility change in

the Islamic world. Few population geographers have sought to do this in this context (Jones, 1990; Bailey 2005) and although the thesis has been limited to exploring only a limited range of variables, it has shown that it is possible to offer systematic explanation of the driving forces producing the new population geographies of one very particular location in the Arab world. Only time will tell whether these forces will continue to drive down fertility in Libya or whether recent political upheavals have transformed the country's demographic regime in ways that may produce new trajectories in fertility.

9.3 POLICY

The formation of public policy on fertility and education was not an objective of this thesis. Nevertheless, it is interesting to reflect on some of the policy implications arising from the thesis:

The evidence of the thesis shows that education has a substantial impact on age at first marriage. This in turn influenced female reproductive behaviour and family size. The findings of this survey provide policy makers with powerful evidence of just which levels of educational investment make the greatest difference to these outcomes. Clearly, the most important finding is that unless women have the opportunity to complete higher education; it is likely that fertility levels in Libya will remain very high. Even with university education, TFRs remain at 3 or over implying childbearing will be 50% or more above replacement levels. If policy makers wish to reduce fertility (and in an Islamic society this is not an easy goal to set) then further investment in encouraging women to stay on to higher education is very desirable. Moreover, the thesis has shown that while this may be a necessary condition for reducing fertility it is not a sufficient condition. Educated women also need a job when they graduate. The fertility differential between employed and unemployed women is a stark one, and the thesis points to the need for policy makers to consider how higher levels of female participation in the workforce could perhaps sought (in 2006 it was as low as 50% of women) as a further way of reducing fertility (chapter 8, p 194-196). In the new era which Libya is entering involving austerity cuts and political uncertainty, these will be difficult targets to achieve.

Consequently the thesis points to the desirability of policy makers developing an education strategy that considers not only educational goals but also the wider demographic impacts of education on raising the age at first marriage, breastfeeding, contraceptive use, CEB, female autonomy, and female participation in the labour market (Benefo, 2006).

The evidence of the current survey (chapter 6, p 129-139) shows that there was a variation in the period of breastfeeding and abstinence. This was used to control or space births and related to educational status. Females with no formal education used the traditional methods of long duration of breastfeeding and abstinence to control or space births more than others. The policy implication of this is that women who aspire to have smaller families, but who currently exceed their ideal family size (some respondents expressed that their actual number of children exceeded the desired number), need to be more aware of the benefits of long-term breastfeeding as well as of using modern contraceptive methods. There is a role here for education to be an active player in helping people to achieve their ambition of having a smaller family, yet at present such advice is not widely available (Bleakley et al, 2011).

Although the thesis has not presented extensive evidence relating to family planning issues (due to the constraints of time in writing a PhD) there is considerable evidence from the research that a gap exists between fertility rates and female fertility aspirations. To close this gap policy-makers, particularly in the education and health sectors should pay attention to promoting family planning programs. The effects of family planning policies on

fertility need to consider both the normative or symbolic connotations of family policies and their correspondence with societal development (Neyer and Andersson, 2007, 9).

Family planning could become an integral part of other programmes promoting child and maternal health and education. Family planning strategies could be marketed by radio and television advertisement campaigns which are currently lacking in Libya.

9.4 THEORY

In taking a holistic approach to fertility decline it is imperative to understand why fertility behaviour has changed. In relation to this, the thesis emphasised the function of formal education especially female education on fertility behaviour, taking into account the complex (direct and indirect) influence of bio-socio-economic variables as determinants of fertility (Fig 9.2).

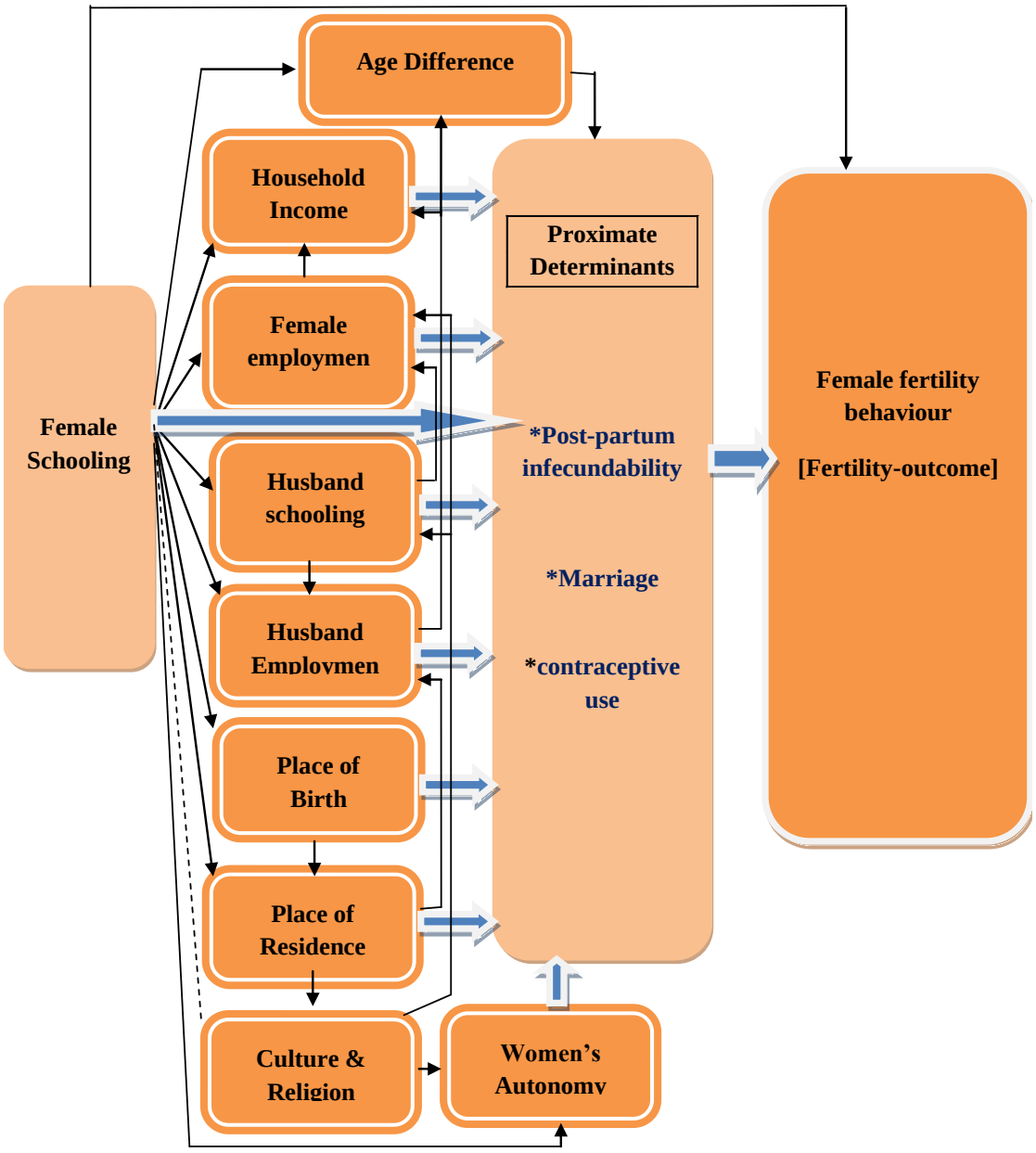


Figure 9-2: Schematic model of the influence of female education on fertility behaviour in Libya

By reviewing the evidence from the current survey and the literature (such as Bongaarts (1982, 1985) and Jeffery and Basu (1996) relating to the demographic circumstances that were associated with changes in female fertility behaviour, it is obvious that female education has affected fertility through its effect on proximate determinants as well as by its direct and indirect influence on fertility through socio-economic factors as indicated in

schematic models in chapters 6, 7 and 8 (proximate determinants, age at first marriage and socio economic determinants of children ever born). The thesis has however sought to go beyond the original models by other researchers in two ways.

First the models have been adapted to match the empirical evidence observed in the Libyan case. In terms of making a conceptual contribution, Figure 9.2 presents a schematic model that includes some important explanatory variables that clearly impact on fertility in a different way in Libya from elsewhere. The influence of female schooling on socio-economic variables includes the interaction of various factors as well as their interaction with the proximate determinants, and eventually impacts on female fertility behaviour.

In terms of the second conceptual contribution, the model includes some variables that have been given too little research by other researchers. The most obvious example is the effect of religion and culture which appear to be significant factors that slow the pace of fertility change. These variables may explain why fertility remained higher than replacement level.

Libya is not a unique case in terms of fertility behaviour. It is similar to some other Arab oil economies where fertility has remained high, even if it has tended to decline in recent decades. Clearly in these cases the high level of fertility is not due to the effect of poverty. In these cases people appear to be continuing to have many children due to cultural influences. In particular it seems probable that the effect of religion arises from the way that Islam

encourages people to have many children, as well as by setting cultural norms which encourage people to have a large family as a signifier of prestige and also as sort of security for elderly people. These suggestions therefore point to the need for future research that goes beyond the quantitative methods of this thesis and the relationships mapped in Figure 9.2. Going beyond these models would involve investigating how cultural norms relating to marriage, religion and value systems influence decisions about ideal family size and impact on the pace of fertility change.

9.5 FUTURE RESEARCH

Six areas of future research can be identified.

Firstly, it is evident from this doctoral study that small scale studies of fertility in Libya exist in a data vacuum. This is because there is no large scale survey in Libya such as the World Fertility Survey. In the absence of larger scale surveys of this kind, it is extremely hard to contextualise small sample surveys and to interpret their significance. So the first and most valuable way of pushing forward with fertility research in Libya would be to establish a large scale internationally recognised survey that could be used as a national benchmark against which more detailed research could be evaluated.

Second, the findings from the current quantitative survey indicate that there is the need to emphasise cultural issues in population studies particularly in fertility (Bailey, 2005). We observed a significant change in fertility but it is still high in terms of being well above replacement levels. As mentioned earlier

religion, cultural norms, and value systems of childbearing are highly resistant to fertility change (Offenhauer, 2005). Therefore, as a researcher, I would support the idea of research that recognises the importance of culture (including religion) and value systems in order to achieve a deeper understanding of female reproductive behaviour. Future research would help towards explaining why some values resist change for a long time, while others disappear relatively quickly.

Third, the evidence in this thesis has shown that there has been a reduction in fertility variations between rural and urban areas. As a researcher it is evident that there is a need for intensive investigation of the reasons for this spatial convergence. Further qualitative research could be based on investigating the socio-economic factors behind the convergence in fertility between rural and urban women.

Fourth, it has been difficult to fully comprehend the role of biological factors such as contraceptive use. This could be attributed to the shortage of detailed studies in this field as well as the sensitivity of this topic amongst respondents to the researcher's survey. This may have prompted many researchers to move away from dealing with this issue. It appears that future studies could benefit from more qualitative research (by using in-depth interviews or ethnographic methods) focusing on issues such as the meanings associated with having children, attitudes towards contraceptive use etc. No such studies have been undertaken on this topic in Libya yet. This could be done by focusing on

females visiting maternity centres and child and health clinics, because it would be easier for researcher to get assistance from doctors (staff) in health centres.

Fifth, there is need for future research to explore the effects of mass media on female knowledge of fertility behaviour and contraceptive use and family planning. The research literature suggests that the mass media has played a very great role in fertility behaviour change and family planning towards contraceptive use in other developing countries (Westoff and Bankole, 1997; Hornik, 2001; Hornik et al., 2001), but in Libya nothing is known on this topic.

Sixth, currently in Libya there is a lack of detailed information on female occupations and female participation in the workforce. Studies at macro and micro level should aim at collecting data on female economic activities, and perhaps by establishing a detailed occupational history model that would have the capacity to link relevant data about female occupation and education to fertility behaviour. As has been shown, occupation played a significant role in fertility decline by reducing number of children (Chapter 8) and increasing of age at first marriage (chapter 7). However, the lack of substantive data and other detailed information on the topic made it difficult to develop more sophisticated models. Accordingly, it is of importance to emphasise on the study of the function of female occupation in fertility change.

In conclusion, this thesis has been pioneering in trying to measure fertility decline in Libya. No other study has tried to analyze (as opposed to describing) the response of fertility to a) the impacts of the proximate determinants and

(b) socio-economic change in Libya and in particular the impact of formal education on fertility behaviour. This said, this final chapter has acknowledged that the author's research has only been able to tackle some of the measurable changes in fertility behaviour. Many questions such as the influence of the changing meaning of marriage and childbearing remain to be researched.

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APPENDIX [A]: QUESTIONNAIRE

Questionnaire Number ( )

Personal Characteristics of respondent and spouse.

What is your date of birth

1) Year (.....) 2) Month (.....)

2-Place of birth (record in space below, if don't know then record this as well

.....

.....

3-What is your present marital status. Are you?

1-Single never married	
2-Married, in first marriage. (complete Q4,5)	
3-Re-married. (complete Q 6,7,8)	
4-Single, widowed, having been married once. (complete Q 9,10,11)	
5-Single, widowed, having been married more than once. (Q 9,10,11)	
6-Single, divorced after first marriage. (complete Q12,13,14)	
7-Single, divorced after more than one marriage.(Q 12,13,14)	

Questions for respondents who are first married

4-How old were you when you were first married?

1) Year (.....) 2) Month (.....)

5-How old is/was your husband when he

1) Married you (.....) 2) Now (.....)

Questions for respondents who are re-married

6-How old were you when you were first married?

1) Year (.....) 2) Month (.....)

7-How old were you when you were divorced?

1) Year (.....) 2) Month (.....)

8-How many children do you have from

1-First marriage (.....) 2-Second marriage (.....)

Questions for respondents who are widows

9-How old were you when you were first married?

1) Year (.....) 2) Month (.....)

10-How old were you when you became widow?

1) Year (.....) 2) Month (.....)

11-How old was your husband when he

1) Married you (.....) 2) Died (.....)

Questions for respondents who are presently divorced and single.

12-How old were you when you were first married?

1) Year (.....) 2) Month (.....)

13-How old were you when you became divorced?

1) Year (.....) 2) Month (.....)

14-How old was your husband when he

1) Married you (.....) 2) Divorced (.....)

15-How many brothers and sisters do you have? (include brothers and sisters who may not be alive any more)

1) Male (.....) 2) Female (.....)

16- Were you the oldest, 2nd oldest, 3rd oldest, etc child?

(.....)

17-What about your husband, How many brothers and sisters do he/did he have? (include widower, divorced)

1) Male (.....) 2) Female (.....)

Education status

18-What is the highest level of education that you have successfully completed to date?

1)None (no schooling)		2) read and write	
3) Primary school		4) elementary school	
5)Secondary school (or institute)		6)University and College	

7) Other (specify).....

.....

19-What is the highest level of education of your husband?

1)None (no schooling		2) read and write	
3) Primary school		4) elementary school	
5)Secondary school (or institute)		6)University and College	

7) Other (specify).....

20-If you left school early; can you tell me why you left school early did? (What level were you in?)

.....

.....

Migration history

21-Have you lived in this village/town/city since all your life?

1)yes (Q24) 2)No (Q22 to23)

22-How long have you been lived in this town/village, city?

(.....)

23- What were the reasons that prompted you to move here? I'm going to read out for you a list of possible reasons; for each reason I read please say how important you think it was?

	a)Very important	b)Of some but not major important	c)Not important at all	d)Don't know
1)Pursuing higher education				
2)Job hunting				
3)Accompanying husband				
4) social problem				

5) Please state other factors which I have not read out to you and which were important in your decision to move here (record below):

.....

Work status

This section includes questions for respondents who are in paid work

24- If you are in paid work, please record occupation in space below, Then go to 25

(.....)

25-When did you start this job?

1) Year (.....) 2) Month (.....)

26- Is the work you are currently doing the first job you have ever had?

Yes (.....) , (Q28) No (.....), (Q 27,28)

27-What paid work did you do before the job you are presently doing? (Record responses in space below).

(.....)

28-Including all the jobs you have done, how many years have you been in paid work?

(.....)

This box includes questions for respondents presently not in paid work

29-If you are not doing paid work, is this because of any of the following reasons?

1) You are not working but you are actively seeking employment? ☐
2) Your husband does not like you to work. ☐
3)Because you are housewife ☐
4)you are student ☐
5) Are there other reasons impeded you to joining in paid work? (Please record in space below);

.....

30-Before now, have you had a paid work?

1)yes (Q31) ☐ 2)No (Q32) ☐

31-Can you tell me what your most recent paid job was? (record in space below)

.....

32-If your husband is/was working, what is your spouse's occupation?

(.....)

33- How long has he been working?

(.....)

Income

34-what is your family income per month?

1)Less than 200 Dinar	☐	2)201-400 D	☐
3)401-600 D	☐	4)601-800 D	☐
5)801-1000 D	☐	6)1001-1200 D	☐
7)1201-1400 D	☐	8)More than 1400 D	☐

35-What is your annual family income?

1)Less than 1000 Dinar	☐	2)1001-2000 D	☐
3)2001-3000 D	☐	4)3001-4000 D	☐
5)4001-5000 D	☐	6)5001-6000 D	☐
7)6001-7000 D	☐	8)7001-8000 D	☐
9)8001-9000D	☐	10) 9001-10000 D	☐
10) More than 10000 D	☐		☐

36- How many of the Following does your family have?

If you have farm, how many hectares does your family have (.....) hectares

If you have Land, how many hectares does your family have (.....) hectares

If you have Animals (e.g. cheeps, goats, cows etc), please how many of them does your family have (record below)

.....

.....

4) If you have cars, are they (new, old and how many does your family have (record below)

.....

5) If you have Shops, how many does your family have? Are they large or small?(record below)

(.....)

6) Please state if you have other property which I have not mention, (record below)

.....

Children characteristics

37- I'd now like to get details about your children; how many children do you have? When and where did you have them?

	Birth Month/year	Death Month/year	Gender	Mother's age at birth	Birth location	Birth site
1)first child						
3)2 th child						
3) 3th child						
4) 4th child						
5) 5th child						
6) 6th child						
7) 7th child						
8) 8th child						
9) 9th child						

38-Have you given birth in the last 12 months?

1)yes ☐ 2)No ☐

39-How many children in total would you like to have, or have had?

Like to have (.....) You have had (.....)

40-Did you breastfeed or are you breastfeeding any of your children?

1) If answer is YES then proceed to complete table below. ☐

2) If answer is NO then move on to next question (Q42). ☐

41- Complete the following table. Enter data in order starting with the information for the oldest child.

Children	Number of months
1)First child	
2)second child	
3) 3th child	
4)4th child	
5) 5th child	
6) 6th child	
7) 7th child	
.....	

42- Have you ever had an abortion?

1)Yes (Q43) ☐ 2)No (Q44) ☐

43- Can you tell me, if you have ever had to have an abortion? What reasons were important in having an abortion?

Read list of reasons in table below, and check off those that apply.

1)you had health problems so you had abortion (health reasons)	
2)the cost of having children (Financial reasons)	
3) you seek to get more free time for your work or your self	
4) to educated your children better	
5) Preserve health of child	
6) Interval between births	
7))please state if you have other reasons which I have not mention, (record below)	
.....	
.....	

Attitudes

44-If you have large family or you tend to have many children that because

1) Religious reasons ☐ 2)Culture reasons (symbol of prestige) ☐

3)Happiness ☐ 4)Insurance for old age ☐

5) Economic factors ☐

6) Other (specify)

.....

45- If you have small family or you tend to control family size and to reduce the number of children that because children cause

1) Pressure on the family budget (cost). ☐

2) Prevents women from working. ☐

3) Weakness in children's education. ☐

4) Social problems between spouses. ☐

5) Much extra work for parents and shortage of free time for parents. ☐

6) Please state other factors which I have not read out to you (record below).

.....

46- If you are in paid work, can you tell me is there any effect of work on having children?

If Yes go to Q 47

If No go to Q 48

47-How can you balance between your work (the effect of work) and having children? ☐

By interval between children to have time for work ☐

By reducing the number of children (control family size) ☐

Other people (e.g. partners , relatives, friends) look after on your children ☐

Please state other ways that I have not read out to you (record below) ☐

.....

48-If you prefer to have more male children than female children, can you tell me which if

any of the following reasons are important to you in having this preference? (if no preference then note this space below and move on to Q 50

1)Because having male children will increase the family income	
2)Because having male children creates social status	
3)Because parents can rely on male children when getting old	
4)Because male children are a symbol of carry family name	
5) Because they provide a labour force	

49-Are there other reasons which I have not mentioned on this list which are important to your preference? (please record this in the space below)

.....

.....

50- Do your children participate in any of the following family income? (if no then note this below and go on to the next question 52):

1)Household chores	
2)Family business	

3) Please state other participations that I have not mentioned (record below).

.....

51- If your children participate in your family income, Are you satisfied with the financial help from them?

Male		Female	
1)Completely satisfied		1)Completely satisfied	
2)Relatively satisfied		2)Relatively satisfied	
3)Not satisfied		3)Not satisfied	

52- Who affect the following persons in your decision of having children?

	1)Very important	2)Important	3)Not important
1)Husband			
2)wife			
3)Both (1-2)			
4)Parents			
5)Relatives			
6)Friends			
7) Other.....			
.....			

53-What do you think about, the best age to get marriage and to have children?

1) Male (.....) 2) Female (.....) 3) Having children (for female) (.....).

54- What do you and your husband think about the ideal family size?

1)Respondent opinion		2)Husband opinion	
1)Family with one or two children (small)		1)Family with one or two children (small)	
2)with three or four children		2)with three or four children	

(medium)		(medium)	
3)Over five children (Large)		3)Over five children (Large)	

55-According to the affect of friends, Is there any effect of your friends on your decision of giving birth or getting marriage?

1)Yes ☐ No ☐

56- If there is affect of friends, can you tell me how their affect was?

.....

.....

57- Do you have future plan for childbearing?

1)Yes (Q58) ☐ 2)No (Q59) ☐

58- If yes please specify.....

.....

59-How the effect of the following on attitudes, knowledge of contraceptive use and family planning information.

	1) Very important	2) Important	3) Not important	4) I do not know
1) Mass media (different Channels...)				
2) Religion (encouragement of having many children)				
3) Customs, traditions (symbol of prestige...)				

Empowerment of women

60-who has the decision making in household in following?

	1)Husband	2)Wife	3)Both
1)Household expenditure			
2)Children's clothes			
3)Medical and health care			
4)Problem solving			
5)Family planning			
6)Having another baby			
7)Visiting relative			

61- I'm now going to introduce list of places that you may be able to go. Which one of these could you go? How often do you go there? Do you go by yourself? Or with someone else, who go with you?

	1)How often	2)On own	With husband	With children	With another women
1)Out to do shopping for food					
2)Out to do shopping for clothes					
3)Out to do shopping for non-essentials such as CDs, videos or DVDs					
4)Go to the doctor if you are a sickness or complaint that is not urgent					
5)Going to hospital to seek treatment					
6)Going to health centre					

7) Visiting friends					
8) Visiting relatives					
9)Going to parties					

62- Now I'm going to ask you about some other activities. For each one could you tell me as precisely as possible; how often you do it?

	1)How often	2)On own/ Accompanied by
1)Use a fixed-line telephone at home to make calls		
2)Use a fixed-line telephone at home to answer calls		
3)Use a mobile phone to make calls		
4)Use a mobile phone to answer calls		
5)Send email messages		
6)Use the internet		
7)Watch TV		
8)Watch video or DVD		
9)Driving a car		

Many thanks in advance for participating in this survey..... The researcher

APPENDIX [B]: DIVISION OF ECONOMIC ACTIVITY

1. Division of Economic Activity 2006 census

Agriculture& Hunting	
Fishing	
Mining& Quarrying	
Manufacturing	
Electricity. Gas & Water	
Construction	
Wholesale & retail trade	
Hotels & restaurant	
Transport, communication & storage	
Financial coordinating	
Real estate Activities	
Administration of the state & Other services	
Education	
Health & social work	
Social & Population related services	
Personal & household services	
Foreign Originations	
Activities not adequately defined	
Seeking work for first time	

2. Division of economic activity in 1984 census

-Agriculture& Hunting & Fishing	
-Mining& Quarrying& Oil extraction	
-Electricity. Gas & Water	
-Construction	
-Wholesale & retail trade& Hotels & restaurant	
-Transport, communication & storage	
-Banks, insurance and real estate services	
-Social & Population related services	

3. Classification of Economic Activity used for the author questionnaire

Classification used	Occupations noted on the questionnaire							
Agriculture& Hunting	agriculture engineer	agriculture police	veterinary	agriculture section	farmer			
Fishing								
Mining& Quarrying	oil company							
Manufacturing	work in factory	carpenter						
Electricity. Gas & Water	electricity section	water company	technician air condition					
Construction	engineer	contractor						
Wholesale & retail trade	trader							
Hotels & restaurant								
Transport, communication & storage	transportation section	taxi driver	post office					
Financial coordinating	accountant							
Real estate Activities								
Administration of the state & Other services	internal security office	officer	military	retired	police section	public security	military police	domestic guard
Education	teacher	education section	lecturer					
Health & social work	nurse	Dentist	medical laboratorial	pharmacist	physician	health section		
Social & Population related services	environmental protection	manpower section	information section					
Personal & household services	housewife							
Foreign Originations								
Activities not adequately defined	self-employment	Employee	mechanic					
Seeking work for first time	student							